Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Purchase Order

Order Date: 03-22-2022

CORRECT ORDER NUMBER MUST APPEAR ON ALL PACKAGES, INVOICES, AND SHIPPING PAPERS. QUESTIONS CONCERNING THIS ORDER SHOULD BE DIRECTED TO THE DEPARTMENT CONTACT.

Order Number:	CPO 0211 4098 GSD2200000018 1	**Procurement Folder:**	773207
Document Name:	East Campus Metal Buildings Project	**Reason for Modification:**	
Document Description:	East Campus Metal Buildings Project	Award of CRFQ GSD2200000014	
Procurement Type:	Central Purchase Order		
Buyer Name:	Melissa Pettrey		
Telephone:	(304) 558-0094		
Email:	melissa.k.pettrey@wv.gov		
Shipping Method:	Best Way	**Effective Start Date:**	
Free on Board:	FOB Dest, Freight Prepaid	**Effective End Date:**	

VENDOR

Vendor Customer Code: VS0000037778
SQP CONSTRUCTION GROUP INC
281 SMILEY DR

ST ALBANS WV 25177
US
Vendor Contact Phone: 3045323659 **Extension:**

Discount Details:

	Discount Allowed	Discount Percentage	Discount Days
#1	No	0.0000	0
#2	Not Entered		
#3	Not Entered		
#4	Not Entered		

DEPARTMENT CONTACT

Requestor Name: Mark A Crites
Requestor Phone: 304-352-5515
Requestor Email: mark.a.crites@wv.gov

22
FILE LOCATION _____

INVOICE TO

DEPARTMENT OF ADMINISTRATION
GENERAL SERVICES DIVISION
103 MICHIGAN AVENUE
CHARLESTON WV 25305
US

SHIP TO

DEPARTMENT OF ADMINISTRATION
GENERAL SERVICES DIVISION GROUNDS SECTION - LOT/BLDG 98
321 MICHIGAN AVE
CHARLESTON WV 25305
US

Total Order Amount:	$16,053,853.00

3/31/2022

Purchasing Division's File Copy

ENTERED

MKP 03/22/2022

PURCHASING DIVISION AUTHORIZATION	**ATTORNEY GENERAL APPROVAL AS TO FORM**	**ENCUMBRANCE CERTIFICATION**
DATE: 03/31/22	**DATE:**	**DATE:** 4/04/2022
ELECTRONIC SIGNATURE ON FILE	**ELECTRONIC SIGNATURE ON FILE**	**ELECTRONIC SIGNATURE ON FILE**

4/1/2022

Extended Description:

One-Time Purchase
Construction

The Vendor, SQP Construction Group Inc., of St. Albans, WV agrees to enter this One-Time Purchase Contract with the WV Department of Administration, General Services Division ("Agency" and "Owner") for new facilities for the Agency's Grounds, Business and Operations and Maintenance Sections on the East portion of the WV State Capitol Complex, per the attached Specifications, Terms & Conditions, Project Plans, Addendum No. 1 dated 10/07/2021,Addendum No. 2 dated 10/15/2012, Addendum No. 3 dated 10/22/2021, Addendum No. 4 dated 11/05/2021, Addendum No. 5 dated 11/17/2021, Addendum No. 6 dated 11/18/2021, Addendum No. 7 dated 12/16/2021, Addendum No. 8 dated 12/30/2021, Addendum No. 9 dated 01/20/2022, Addendum No. 10 dated 02/07/2022, Addendum No. 11 dated 02/23/2022 and the Vendors submitted and accepted bid, dated 03/01/2022 incorporated herein by reference and made a part hereof.

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
1	81101513	0.00000		0.000000	11578618.00
Service From	**Service To**	**Manufacturer**		**Model No**	
2022-04-01	2024-04-30				

Commodity Line Description: East Campus Metal Buildings Project

Extended Description:
Base Bid

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
2	81101513	0.00000		0.000000	2797510.00
Service From	**Service To**	**Manufacturer**		**Model No**	
2022-04-01	2023-10-23				

Commodity Line Description: East Campus Metal Buildings Project

Extended Description:
Alternate 1

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
3	81101513	0.00000		0.000000	688428.00
Service From	**Service To**	**Manufacturer**		**Model No**	
2022-04-01	2024-04-30				

Commodity Line Description: East Campus Metal Buildings Project

Extended Description:
Alternate #2

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
4	81101513	0.00000		0.000000	989297.00
Service From	**Service To**	**Manufacturer**		**Model No**	
2022-04-01	2024-04-30				

Commodity Line Description: East Campus Metal Buildings Project

Extended Description:
Alternate #3

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
5	81101513	0.00000	EA	66.000000	0.00
Service From	**Service To**	**Manufacturer**		**Model No**	
2022-04-01	2024-04-30				

Commodity Line Description: East Campus Metal Buildings Project

Extended Description:
Unit price No.1
18 inch augered cast piling. Price per TWO (2) Linear feet.

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
6	81101513	0.00000	EA	55.000000	0.00
Service From	**Service To**	**Manufacturer**		**Model No**	
2022-04-01	2024-04-30				

Commodity Line Description: East Campus Metal Buildings Project

Extended Description:
Unit Price No. 2
16 inch augered cast piling. Price per TWO (2) Linear feet.

GENERAL TERMS AND CONDITIONS:

1. CONTRACTUAL AGREEMENT: Issuance of an Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance by the State of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid, or on the Contract if the Contract is not the result of a bid solicitation, signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

2. DEFINITIONS: As used in this Solicitation/Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation/Contract.

2.1. "Agency" or **"Agencies"** means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

2.2. "Bid" or **"Proposal"** means the vendors submitted response to this solicitation.

2.3. "Contract" means the binding agreement that is entered into between the State and the Vendor to provide the goods or services requested in the Solicitation.

2.4. "Director" means the Director of the West Virginia Department of Administration, Purchasing Division.

2.5. "Purchasing Division" means the West Virginia Department of Administration, Purchasing Division.

2.6. "Award Document" means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the contract holder.

2.7. "Solicitation" means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

2.8. "State" means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

2.9. "Vendor" or **"Vendors"** means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

3. CONTRACT TERM; RENEWAL; EXTENSION: The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

☐ **Term Contract**

Initial Contract Term: This Contract becomes effective on _____ and the initial contract term extends until _____.

Renewal Term: This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal should be delivered to the Agency and then submitted to the Purchasing Division thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Unless otherwise specified below, renewal of this Contract is limited to _____ successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed the total number of months available in all renewal years combined. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

☐ **Alternate Renewal Term** – This contract may be renewed for _____ successive _____ year periods or shorter periods provided that they do not exceed the total number of months contained in all available renewals. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

Delivery Order Limitations: In the event that this contract permits delivery orders, a delivery order may only be issued during the time this Contract is in effect. Any delivery order issued within one year of the expiration of this Contract shall be effective for one year from the date the delivery order is issued. No delivery order may be extended beyond one year after this Contract has expired.

☑ **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within Seven hundred and Eighty (780) days.

☐ **Fixed Period Contract with Renewals:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and part of the Contract more fully described in the attached specifications must be completed within _____ days. Upon completion of the work covered by the preceding sentence, the vendor agrees that maintenance, monitoring, or warranty services will be provided for _____ year(s) thereafter.

☐ **One Time Purchase:** The term of this Contract shall run from the issuance of the Award Document until all of the goods contracted for have been delivered, but in no event will this Contract extend for more than one fiscal year.

☐ **Other:** See attached _____

4. AUTHORITY TO PROCEED: Vendor is authorized to begin performance of this contract on the date of encumbrance listed on the front page of the Award Document unless either the box for "Fixed Period Contract" or "Fixed Period Contract with Renewals" has been checked in Section 3 above. If either "Fixed Period Contract" or "Fixed Period Contract with Renewals" has been checked, Vendor must not begin work until it receives a separate notice to proceed from the State. The notice to proceed will then be incorporated into the Contract via change order to memorialize the official date that work commenced.

5. QUANTITIES: The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

☐ **Open End Contract:** Quantities listed in this Solicitation/Award Document are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

☐ **Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

☑ **Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

☐ **One Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

6. EMERGENCY PURCHASES: The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute of breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

7. REQUIRED DOCUMENTS: All of the items checked below must be provided to the Purchasing Division by the Vendor as specified below.

☑ **BID BOND (Construction Only):** Pursuant to the requirements contained in W. Va. Code § 5-22-1(c), All Vendors submitting a bid on a construction project shall furnish a valid bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

☑ **PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of 100% of the contract. The performance bond must be received by the Purchasing Division prior to Contract award.

☑ **LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be delivered to the Purchasing Division prior to Contract award.

In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under $100,000. Personal or business checks are not acceptable. Notwithstanding the foregoing, West Virginia Code § 5-22-1 (d) mandates that a vendor provide a performance and labor/material payment bond for construction projects. Accordingly, substitutions for the performance and labor/material payment bonds for construction projects is not permitted.

☐ **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

☐ **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section of the General Terms and Conditions entitled Licensing, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits upon request and in a form acceptable to the State. The request may be prior to or after contract award at the State's sole discretion.

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The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications regardless of whether or not that requirement is listed above.

8. INSURANCE: The apparent successful Vendor shall furnish proof of the insurance identified by a checkmark below and must include the State as an additional insured on each policy prior to Contract award. The insurance coverages identified below must be maintained throughout the life of this contract. Thirty (30) days prior to the expiration of the insurance policies, Vendor shall provide the Agency with proof that the insurance mandated herein has been continued. Vendor must also provide Agency with immediate notice of any changes in its insurance policies, including but not limited to, policy cancelation, policy reduction, or change in insurers. The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether that insurance requirement is listed in this section.

Vendor must maintain:

☑ **Commercial General Liability Insurance** in at least an amount of: $1,000,000.00 per occurrence.

☑ **Automobile Liability Insurance** in at least an amount of: $1,000,000.00 per occurrence.

☐ **Professional/Malpractice/Errors and Omission Insurance** in at least an amount of: _____ per occurrence. Notwithstanding the forgoing, Vendor's are not required to list the State as an additional insured for this type of policy.

☑ **Commercial Crime and Third Party Fidelity Insurance** in an amount of: $100,000.00 per occurrence.

☐ **Cyber Liability Insurance** in an amount of: _____ per occurrence.

☑ **Builders Risk Insurance** in an amount equal to 100% of the amount of the Contract.

☐ **Pollution Insurance** in an amount of: _____ per occurrence.

☐ **Aircraft Liability** in an amount of: _____ per occurrence.

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Notwithstanding anything contained in this section to the contrary, the Director of the Purchasing Division reserves the right to waive the requirement that the State be named as an additional insured on one or more of the Vendor's insurance policies if the Director finds that doing so is in the State's best interest.

9. WORKERS' COMPENSATION INSURANCE: Vendor shall comply with laws relating to workers compensation, shall maintain workers' compensation insurance when required, and shall furnish proof of workers' compensation insurance upon request.

10. [Reserved]

11. LIQUIDATED DAMAGES: This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy. Vendor shall pay liquidated damages in the amount specified below or as described in the specifications:

☐ _____ for _____.

☑ Liquidated Damages Contained in the Specifications.

☐ Liquidated Damages Are Not Included in this Contract.

12. ACCEPTANCE: Vendor's signature on its bid, or on the certification and signature page, constitutes an offer to the State that cannot be unilaterally withdrawn, signifies that the product or service proposed by vendor meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise indicated, and signifies acceptance of the terms and conditions contained in the Solicitation unless otherwise indicated.

13. PRICING: The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification. Notwithstanding the foregoing, Vendor must extend any publicly advertised sale price to the State and invoice at the lower of the contract price or the publicly advertised sale price.

14. PAYMENT IN ARREARS: Payments for goods/services will be made in arrears only upon receipt of a proper invoice, detailing the goods/services provided or receipt of the goods/services, whichever is later. Notwithstanding the foregoing, payments for software maintenance, licenses, or subscriptions may be paid annually in advance.

15. PAYMENT METHODS: Vendor must accept payment by electronic funds transfer and P-Card. (The State of West Virginia's Purchasing Card program, administered under contract by a banking institution, processes payment for goods and services through state designated credit cards.)

16. TAXES: The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

17. ADDITIONAL FEES: Vendor is not permitted to charge additional fees or assess additional charges that were not either expressly provided for in the solicitation published by the State of West Virginia, included in the Contract, or included in the unit price or lump sum bid amount that Vendor is required by the solicitation to provide. Including such fees or charges as notes to the solicitation may result in rejection of vendor's bid. Requesting such fees or charges be paid after the contract has been awarded may result in cancellation of the contract.

18. FUNDING: This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available. If that occurs, the State may notify the Vendor that an alternative source of funding has been obtained and thereby avoid the automatic termination. Non-appropriation or non-funding shall not be considered an event of default.

19. CANCELLATION: The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may also cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules § 148-1-5.2.b.

20. TIME: Time is of the essence regarding all matters of time and performance in this Contract.

21. APPLICABLE LAW: This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code, or West Virginia Code of State Rules is void and of no effect.

22. COMPLIANCE WITH LAWS: Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendor acknowledges that it has reviewed, understands, and will comply with all applicable laws, regulations, and ordinances.

> **SUBCONTRACTOR COMPLIANCE:** Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to comply with all applicable laws, regulations, and ordinances. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

23. ARBITRATION: Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

24. MODIFICATIONS: This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any change to existing contracts that adds work or changes contract cost, and were not included in the original contract, must be approved by the Purchasing Division and the Attorney General's Office (as to form) prior to the implementation of the change or commencement of work affected by the change.

25. WAIVER: The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

26. SUBSEQUENT FORMS: The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

27. ASSIGNMENT: Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments.

28. WARRANTY: The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

29. STATE EMPLOYEES: State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

30. PRIVACY, SECURITY, AND CONFIDENTIALITY: The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in http://www.state.wv.us/admin/purchase/privacy/default.html.

31. YOUR SUBMISSION IS A PUBLIC DOCUMENT: Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

32. LICENSING: In accordance with West Virginia Code of State Rules § 148-1-6.1.e, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

SUBCONTRACTOR COMPLIANCE: Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to be licensed, in good standing, and up-to-date on all state and local obligations as described in this section. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

33. ANTITRUST: In submitting a bid to, signing a contract with, or accepting a Award Document from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

34. VENDOR CERTIFICATIONS: By signing its bid or entering into this Contract, Vendor certifies (1) that its bid or offer was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid or offer for the same material, supplies, equipment or services; (2) that its bid or offer is in all respects fair and without collusion or fraud; (3) that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and (4) that it has reviewed this Solicitation in its entirety; understands the requirements, terms and conditions, and other information contained herein.

Vendor's signature on its bid or offer also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency. The individual signing this bid or offer on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or offer or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

35. VENDOR RELATIONSHIP: The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, etc. and the filing of all necessary documents, forms, and returns pertinent to all of the foregoing.

Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

36. INDEMNIFICATION: The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

37. PURCHASING AFFIDAVIT: In accordance with West Virginia Code §§ 5A-3-10a and 5-22-1(i), the State is prohibited from awarding a contract to any bidder that owes a debt to the State or a political subdivision of the State, Vendors are required to sign, notarize, and submit the Purchasing Affidavit to the Purchasing Division affirming under oath that it is not in default on any monetary obligation owed to the state or a political subdivision of the state.

38. CONFLICT OF INTEREST: Vendor, its officers or members or employees, shall not presently have or acquire an interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

39. REPORTS: Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

☑ Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

☐ Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at purchasing.division@wv.gov.

40. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check. Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

41. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS: Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.

b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:

c. The cost for each contract item used does not exceed one tenth of one percent (.1%)

of the total contract cost or two thousand five hundred dollars ($2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or

d. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

42. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL: In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars ($50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a "substantial labor surplus area", as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products. This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

43. INTERESTED PARTY SUPPLEMENTAL DISCLOSURE: W. Va. Code § 6D-1-2 requires that for contracts with an actual or estimated value of at least $1 million, the vendor must submit to the Agency a supplemental disclosure of interested parties reflecting any new or differing interested parties to the contract, which were not included in the original pre-award interested party disclosure, within 30 days following the completion or termination of the contract. A copy of that form is included with this solicitation or can be obtained from the

WV Ethics Commission. This requirement does not apply to publicly traded companies listed on a national or international stock exchange. A more detailed definition of interested parties can be obtained from the form referenced above.

44. PROHIBITION AGAINST USED OR REFURBISHED: Unless expressly permitted in the solicitation published by the State, Vendor must provide new, unused commodities, and is prohibited from supplying used or refurbished commodities, in fulfilling its responsibilities under this Contract.

45. VOID CONTRACT CLAUSES – This Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law.

ADDITIONAL TERMS AND CONDITIONS (Construction Contracts Only)

1. CONTRACTOR'S LICENSE: Until June 15, 2021, West Virginia Code § 21-11-2, and after that date, § 30-42-2, requires that all persons desiring to perform contracting work in this state be licensed. The West Virginia Contractors Licensing Board is empowered to issue the contractor's license. Applications for a contractor's license may be made by contacting the West Virginia Contractor Licensing Board.

The apparent successful Vendor must furnish a copy of its contractor's license prior to the issuance of a contract award document.

2. DRUG-FREE WORKPLACE AFFIDAVIT: W. Va. Code § 21-1D-5 provides that any solicitation for a public improvement contract requires each Vendor that submits a bid for the work to submit an affidavit that the Vendor has a written plan for a drug-free workplace policy. If the affidavit is not submitted with the bid submission, the Purchasing Division shall promptly request by telephone and electronic mail that the low bidder and second low bidder provide the affidavit within one business day of the request. Failure to submit the affidavit within one business day of receiving the request shall result in disqualification of the bid. To comply with this law, Vendor should complete the enclosed drug-free workplace affidavit and submit the same with its bid. Failure to submit the signed and notarized drugfree workplace affidavit or a similar affidavit that fully complies with the requirements of the applicable code, within one business day of being requested to do so shall result in disqualification of Vendor's bid. Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is $100,000 or less or temporary or emergency repairs.

2.1. DRUG-FREE WORKPLACE POLICY: Pursuant to W. Va. Code § 21-1D-4, Vendor and its subcontractors must implement and maintain a written drug-free workplace policy that complies with said article. The awarding public authority shall cancel this contract if: (1) Vendor fails to implement and maintain a written drug-free workplace policy described in the preceding paragraph, (2) Vendor fails to provide information regarding implementation of its drug-free workplace policy at the request of the public authority; or (3) Vendor provides to the public authority false information regarding the contractor's drug-free workplace policy.

Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is $100,000 or less or temporary or emergency repairs.

3. DRUG FREE WORKPLACE REPORT: Pursuant to W. Va. Code § 21-1D-7b, no less than once per year, or upon completion of the project, every contractor shall provide a certified report to the public authority which let the contract. For contracts over $25,000, the public authority shall be the West Virginia Purchasing Division. For contracts of $25,000 or less, the public authority shall be the agency issuing the contract. The report shall include:

(1) Information to show that the education and training service to the requirements of West Virginia Code § 21-1D-5 was provided;

(2) The name of the laboratory certified by the United States Department of Health and Human Services or its successor that performs the drug tests;

(3) The average number of employees in connection with the construction on the public improvement;

(4) Drug test results for the following categories including the number of positive tests and the number of negative tests: (A) Pre-employment and new hires; (B) Reasonable suspicion; (C) Post-accident; and (D) Random.

Vendor should utilize the attached Certified Drug Free Workplace Report Coversheet when submitting the report required hereunder. Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is $100,000 or less or temporary or emergency repairs.

4. AIA DOCUMENTS: All construction contracts that will be completed in conjunction with architectural services procured under Chapter 5G of the West Virginia Code will be governed by the attached AIA documents, as amended by the Supplementary Conditions for the State of West Virginia, in addition to the terms and conditions contained herein.

4A. PROHIBITION AGAINST GENERAL CONDITIONS: Notwithstanding anything contained in the AIA Documents or the Supplementary Conditions, the State of West Virginia will not pay for general conditions, or winter conditions, or any other condition representing a delay in the contracts. The Vendor is expected to mitigate delay costs to the greatest extent possible and any costs associated with Delays must be specifically and concretely identified. The state will not consider an average daily rate multiplied by the number of days extended to be an acceptable charge.

5. GREEN BUILDINGS MINIMUM ENERGY STANDARDS: In accordance with § 22-29-4, all new building construction projects of public agencies that have not entered the schematic design phase prior to July 1, 2012, or any building construction project receiving state grant funds and appropriations, including public schools, that have not entered the schematic design phase prior to July 1, 2012, shall be designed and constructed complying with the ICC International Energy Conservation Code, adopted by the State Fire Commission, and the ANSI/ASHRAE/IESNA Standard 90.1-2007: Provided, That if any construction project has a commitment of federal funds to pay for a portion of such project, this provision shall only apply to the extent such standards are consistent with the federal standards.

6. LOCAL LABOR MARKET HIRING REQUIREMENT: Pursuant to West Virginia Code §21-1C-1 et seq., Employers shall hire at least seventy-five percent of employees for public improvement construction projects from the local labor market, to be rounded off, with at least two employees from outside the local labor market permissible for each employer per project.

Any employer unable to employ the minimum number of employees from the local labor market shall inform the nearest office of Workforce West Virginia of the number of qualified employees needed and provide a job description of the positions to be filled.

If, within three business days following the placing of a job order, Workforce West Virginia is unable to refer any qualified job applicants to the employer or refers less qualified job applicants than the number requested, then Workforce West Virginia shall issue a waiver to the employer stating the unavailability of applicant and shall permit the employer to fill any positions covered by the waiver from outside the local labor market. The waiver shall be in writing and shall be issued within the prescribed three days. A waiver certificate shall be sent to both the employer for its permanent project records and to the public authority.

Any employer who violates this requirement is subject to a civil penalty of $250 per each employee less than the required threshold of seventy-five percent per day of violation after receipt of a notice of violation.

Any employer that continues to violate any provision of this article more than fourteen calendar days after receipt of a notice of violation is subject to a civil penalty of $500 per each employee less than the required threshold of seventy-five percent per day of violation.

The following terms used in this section have the meaning shown below.

(1) The term "construction project" means any construction, reconstruction, improvement, enlargement, painting, decorating or repair of any public improvement let to contract in an amount equal to or greater than $500,000. The term "construction project" does not include temporary or emergency repairs;

(2) The term "employee" means any person hired or permitted to perform hourly work for wages by a person, firm or corporation in the construction industry; The term "employee" does not include:(i) Bona fide employees of a public authority or individuals engaged in making temporary or emergency repairs;(ii) Bona fide independent contractors; or(iii) Salaried supervisory personnel necessary to assure efficient execution of the employee's work;

(3) The term "employer" means any person, firm or corporation employing one or more employees on any public improvement and includes all contractors and subcontractors;

(4) The term "local labor market" means every county in West Virginia and any county outside of West Virginia if any portion of that county is within fifty miles of the border of West Virginia;

(5) The term "public improvement" includes the construction of all buildings, roads, highways, bridges, streets, alleys, sewers, ditches, sewage disposal plants, waterworks, airports and all other structures that may be let to contract by a public authority, excluding improvements funded, in whole or in part, by federal funds.

7. DAVIS-BACON AND RELATED ACT WAGE RATES:

☐ The work performed under this contract is federally funded in whole, or in part. Pursuant to _____, Vendors are required to pay applicable Davis-Bacon wage rates.

☑ The work performed under this contract is not subject to Davis-Bacon wage rates.

8. SUBCONTRACTOR LIST SUBMISSION: In accordance with W. Va. Code § 5-22-1, the apparent low bidder on a contract valued at more than $250,000.00 for the construction, alteration, decoration, painting or improvement of a new or existing building or structure shall submit a list of all subcontractors who will perform more than $25,000.00 of work on the project including labor and materials. (This section does not apply to any other construction projects, such as highway, mine reclamation, water or sewer projects.) The subcontractor list shall be provided to the Purchasing Division within one business day of the opening of bids for review. If the apparent low bidder fails to submit the subcontractor list, the Purchasing Division shall promptly request by telephone and electronic mail that the low bidder and second low bidder provide the subcontractor list within one business day of the request. Failure to submit the subcontractor list within one business day of receiving the request shall result in disqualification of the bid.

If no subcontractors who will perform more than $25,000.00 of work are to be used to complete the project, the apparent low bidder must make this clear on the subcontractor list, in the bid itself, or in response to the Purchasing Division's request for the subcontractor list.

a. Required Information. The subcontractor list must contain the following information:

i. Bidder's name

ii. Name of each subcontractor performing more than $25,000 of work on the project.

iii. The license number of each subcontractor, as required by W. Va. Code § 21-11-1 et. seq.

iv. If applicable, a notation that no subcontractor will be used to perform more than $25,000.00 of work. (This item iv. is not required if the vendor makes this clear in the bid itself or in documentation following the request for the subcontractor list.)

b. Subcontractor List Submission Form: The subcontractor list may be submitted in any form, including the attached form, as long as the required information noted above is included. If any information is missing from the bidder's subcontractor list submission, it may be obtained from other documents such as bids, emails, letters, etc. that accompany the subcontractor list submission.

c. Substitution of Subcontractor. Written approval must be obtained from the State Spending Unit before any subcontractor substitution is permitted. Substitutions are not permitted unless:

i. The subcontractor listed in the original bid has filed for bankruptcy;

ii. The subcontractor in the original bid has been debarred or suspended; or

iii. The contractor certifies in writing that the subcontractor listed in the original bid fails, is unable, or refuses to perform his subcontract.

Subcontractor List Submission (Construction Contracts Only)

Bidder's Name: SQP Construction Group Inc.

☐ Check this box if no subcontractors will perform more than $25,000.00 of work to complete the project.

Subcontractor Name	License Number if Required by W. Va. Code § 21-11-1 et. seq.
Garage Door Operators Inc.	WV003611
May Contracting Inc.	WV040555
A J Vater & Co Inc.	WV001397
Easley & Rivers Inc.	WV001303
TKS Contracting Inc.	WV010684
Brewer & Company of WV Inc.	WV001124
Nitro Construction Services Inc.	WV042601
Cherry River Construction LLC.	WV049126
Grout Systems Inc.	WV013871
West Virginia Paving Inc.	WV001429
Dennlers Fencing LLC	WV011495
Wood Heating & Air Conditioning LLC	WV056776
Robinson and Son Plumbing HTG Inc	WV003087

Attach additional pages if necessary

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

(Name, Title)
Donald O. Gatewood, President

(Printed Name and Title)
281 Smiley Drive, St. Albans, WV 25177

(Address)
304-440-9200

(Phone Number) / (Fax Number)
dgatewood@sqpgc.com

(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that: I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

By signing below, I further certify that I understand this Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law.

SQP Construction Group Inc.

(Company)

(Authorized Signature) (Representative Name, Title)

Donald O. Gatewood, President

(Printed Name and Title of Authorized Representative)

March 1, 2022

(Date)

304-440-9200

(Phone Number) (Fax Number)

GENERAL CONSTRUCTION SPECIFICATIONS

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of the WV Department of Administration, General Services Division ("Agency" and "Owner") to establish a contract for phased sitework and metal building construction to provide for new facilities for the Agency's Grounds, Business and Operations and Maintenance Sections on the East portion of the WV State Capitol Complex, as described in the construction documents. The Work potentially includes demolition of several existing Agency-owned structures, possible construction of a new Central Mailroom, and possible sitework to grade and pave in order to provide for new parking lots, as determined by the award of a Base Bid and multiple potential Add-Alternates. Chapman Technical Group is serving as the Architect on this project.

2. **DEFINITIONS:** The terms listed below shall have the meanings assigned to them below. Additional definitions can be found in section 2 of the General Terms and Conditions and in the Specifications Manual as defined below.

   2.1 "Construction Services" means sitework and construction of new metal building facilities on the East Capitol Complex, as more fully described in these specifications and the Specifications/Project Manual.

   2.2 "Pricing Page" means the pages contained in wvOASIS, attached hereto as Exhibit A, upon which Vendor should list its proposed price for the Construction Services.

   2.3 "Solicitation" means the official notice of an opportunity to supply the State with Construction Services that is published by the Purchasing Division.

   2.4 "Specifications/Project Manual" means the American Institute of Architect forms, specifications, plans, drawings, and related documents developed by the architect, engineer, or Agency that provide detailed instructions on how the Construction Services are to be performed along with any American Institute of Architects documents ("AIA documents") attached thereto.

3. **ORDER OF PRECEDENCE:** This General Construction Specifications document will have priority over, and supersede, anything contained in the Specifications/Project Manual.

4. **QUALIFICATIONS:** Vendor, or Vendor's staff if requirements are inherently limited to individuals rather than corporate entities, shall have the following minimum qualifications:

   4.1. Experience: Vendor, or Vendor's supervisory staff assigned to this project, must have successfully completed at least Three (3) projects that involved work similar to that described in the Specifications/Project Manual. Compliance with this experience requirement will be determined prior to contract award by the State through references provided by the Vendor upon request, through knowledge or documentation of the

Vendor's past projects, through confirmation of experience requirements from the architect assisting the State in this project, or some other method that the State determines to be acceptable. Vendor must provide any documentation requested by the State to assist in confirmation of compliance with this provision. References, documentation, or other information to confirm compliance with this experience requirement may be requested after bid opening and prior to contract award.

5. **CONTRACT AWARD:** The Contract is intended to provide Agency with a purchase price for the Construction Services. The Contract will be awarded to the lowest qualified responsible bidder meeting the required specifications. If the Pricing Pages contain alternates/add-ons, the Contract will be awarded based on the grand total of the base bid and any alternates/add-ons selected.

6. **SELECTION OF ALTERNATES:** Pursuant to W. Va. Code § 5-22-1(f), any solicitation of bids shall include no more than five alternates. Alternates, if accepted, shall be accepted in the order in which they are listed on the bid form. Any unaccepted alternate contained within a bid shall expire 90 days after the date of the opening of bids for review. Determination of the lowest qualified responsible bidder shall be based on the sum of the base bid and any alternates accepted. Alternate selection will be identified in the Purchase Order.

7. **PROGRESS PAYMENTS:** The Vendor will be paid in the form of periodic progress payments for work completed. Payment requests along with documentation supporting the request will be submitted to and reviewed by the Architect. If approved, the Architect will communicate approval to the Owner and Owner will process payment. The Owner reserves the right to withhold liquidated damages from progress payments. Progress payments will be made no more than monthly.

   Approval and payment of progress payments will be based on Contractor's submission of a payment allocation schedule which allocates the entire contract sum to payment milestones. Architect and Owner will review the payment allocation and may mandate changes that they believe are necessary.

8. **RETAINAGE:** Agency is entitled to withhold Ten Percent (10%) from each progress payment made as retainage. Agency will partially release retainage upon certification of substantial completion by the Architect in accordance with this Contract but will continue to retain amounts sufficient to cover activities needed to reach final completion.

9. **PERFORMANCE:** Vendor shall perform the Construction Services in accordance with this document and the Specifications/Project Manual.

10. **SUBSTANTIAL AND FINAL COMPLETION:** Vendor shall achieve substantial completion, by Phase, as indicated below, with the stated number of calendar days after the Contract start date established by the issuance of the Notice to Proceed. See Drawing G-003, Alternates and Phasing Plan. Failure to meet the deadlines established herein, unless extended

by change order authorizing additional time free of liquidated damages, will result in liquidated damages being applied:

Phase A (1, 2 & 3): Substantially Complete within Three Hundred and Thirty (330) calendar days after the start date established by the issuance of the Notice to Proceed.

Phase B (1 & 2): Substantially Complete within Seven Hundred (700) calendar days after the start date established by the issuance of the Notice to Proceed.

Phase C1: If awarded as Alternate #1, Substantially Complete within Four Hundred and Eighty (480) calendar days after the start date established by the issuance of the Notice to Proceed.

Phase C2: Phase C2 may not begin until Phase C1 has been Substantially Completed and the personnel and equipment of the WV Office of Technology is moved into the new Mailroom, but otherwise must be Substantially Complete within Seven Hundred (700) calendar days after the start date established by the issuance of the Notice to Proceed.

Phase D: If awarded as Alternate #2, Phase D may not begin until Phase C2 has at least begun, but otherwise must be Substantially Complete within Seven Hundred (700) calendar days after the start date established by the issuance of the Notice to Proceed.

Phase E: If awarded as Alternate #3, Phase E must be Substantially Complete within Seven Hundred (700) calendar days after the start date established by the issuance of the Notice to Proceed.

Final Completion: For each of the aforementioned Phases, Final Completion is to be achieved no later than Thirty (30) calendar days after Substantial Completion.

11. **LIQUIDATED DAMAGES:** Vendor shall pay Liquidated Damages in the amount of $2,500.00 per calendar day for every calendar day beyond the date for Final Completion, as established by the issuance of the Notice to Proceed, for which Final Completion has not been achieved for any Phase. Damages may be imposed for more than one phase.

12. **PROJECT PLANS:** Copies of the project plans can be obtained by contacting the entity identified below.

    Chapman Technical Group
    200 Sixth Avenue
    St. Albans, West Virginia 25177
    (for a non-refundable fee of $150.00 per set).

    Vendors may also obtain Project Manuals and Drawings through Chapman Technical Group's Plan Room on its website at www.chaptech.com, or by contacting McKenzie Young at myoung@chaptech.com or 304-727-5501.

13. **SUBSTITUTIONS:** Any substitution requests must be submitted in accordance with the official question and answer period described in the INSTRUCTIONS TO VENDORS SUBMITTING BIDS, Paragraph 4. Vendor Question Deadline.

14. **FACILITIES ACCESS:** Performance of Contract Services may require access cards and/or keys to gain entrance to Agency's facilities. In the event that access cards and/or keys are required:

    14.1. Vendor must identify principal service personnel which will be issued access cards and/or keys to perform service.

    14.2. Vendor will be responsible for controlling cards and keys and will pay replacement fee, if the cards or keys become lost or stolen.

    14.3. Vendor shall notify Agency immediately of any lost, stolen, or missing card or key.

    14.4. Anyone performing under this Contract will be subject to Agency's security protocol and procedures.

    14.5. Vendor shall inform all staff of Agency's security protocol and procedures.

15. **MISCELLANEOUS:**

    15.1. Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

    Contract Manager: _____
    Telephone Number: _____
    Fax Number: _____
    Email Address: _____

    15.2. Owner's Representative: Owner's representative for notice purposes is:

    Name: Mark A. Crites
    Telephone Number: (304)352-5515
    Fax Number: (304)558-1475
    Email Address: Mark.A.Crites@wv.gov

16. **Initial Decision Maker:** Chapman Technical Group, the Architect, shall serve as the Initial Decision Maker in matters relating to this contract.

Exhibit A Pricing Page
(Addendum No. 5 Revised Pricing Page)

State of West Virginia – General Services Division – East Campus Project

Name of Bidder:

SQP Construction Group Inc.

The Bidder, being familiar with and understanding the Bidding Documents and also having examined the site and being familiar with all local conditions affecting the project hereby proposes to furnish all labor, material, equipment, supplies and transportation and to perform all Work in accordance with the Bidding Documents within the time set forth for the sum of:

Base Bid:

$ 11,578,618.00 **(Commodity Line 1)(A)**

Eleven Million Five Hundred Seventy Eight Thousand Six Hundred Eighteen

(Show amount in both words and numbers)

Alternate #1 Bid (All work associated with the construction of the new mailroom and demolition of the existing mailroom, Phase C, per Specifications Section 012300):

$ 2,797,510.00 **(Commodity Line 2)(B)**

Two Million Seven Hundred Ninety Seven Thousand Five Hundred Ten Dollars

(Show amount in both words and numbers)

Alternate #2 Bid (All work associated with the utilities, paving and light poles for the generator yard, road and parking area, Phase D , per Specifications Section 012300):

$ 688,428.00 **(Commodity Line 3)(C)**

Six Hundred Eighty Eight Thousand Four Hundred Twenty Eight Dollars

(Show amount in both words and numbers)

Alternate #3 Bid (All work associated with the utilities, paving, light poles and storm retention area for the parking area, Phase E , per Specifications Section 012300):

$ 989,297.00 **(Commodity Line 4)(D)**

Nine Hundred Eighty Nine Thousand Two Hundred Ninety Seven Dollars

(Show amount in both words and numbers)

Unit Price #1, 18 Inch Augered Cast Piles: Add/deduct all-inclusive price, per two linear feet, to cover variation in actual depths of 18" diameter Augered Cast Piles to what is indicated in the Project Plans (See Project Manual, Division 1, Section 012200):

$ 66.00 **(Commodity Line 5), per two linear feet. (E)**

Sixty Six Dollars

(Show amount in both words and numbers)

Unit Price #2, 16 Inch Augered Cast Piles: Add/deduct all-inclusive price, per two linear feet, to cover variation in actual depths of 16" diameter Augered Cast Piles to what is indicated in the Project Plans (See Project Manual, Division 1, Section 012200):

$ 55.00 **(Commodity Line 6), per two linear feet. (F)**

Fifty Five Dollars

(Show amount in both words and numbers)

TOTAL BID AMOUNT (A+B+C+D+E+F):

$ 16,053,974.00

Sixteen Million Fifty Three Thousand Nine Hundred Seventy Four Dollars

(Show amount in both words and numbers)

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Request for Quote
Construction

Proc Folder: 773207 **Doc Description:** Addendum No. 11 East Campus Metal Buildings Project **Proc Type:** Central Purchase Order			**Reason for Modification:** Addendum No. 11
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2022-02-23	2022-03-01 13:30	CRFQ 0211 GSD2200000014	12

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

State : **Country :** **Zip :**

Principal Contact :

Vendor Contact Phone: **Extension:**

FOR INFORMATION CONTACT THE BUYER
Melissa Pettrey
(304) 558-0094
melissa.k.pettrey@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

SOLICITATION NUMBER: CRFQ GSD2200000014
Addendum Number: 11

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[✓] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[ ] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[✓] Other

Description of Modification to Solicitation:

Addendum No. 11 is issued to provide the following information to vendors:

1. To revise the Bid Opening Date to March 1, 2022. The time remains 1:30pm.
2. To provide bid clarification that security controls are to be bid "as specified" in regard to the original solicitation and information provided in subsequent issued Addenda.

No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Request for Quote
Construction

Proc Folder: 773207 **Doc Description:** Addendum No. 10 East Campus Metal Buildings Project **Proc Type:** Central Purchase Order			**Reason for Modification:** Addendum No. 10
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2022-02-07	2022-02-24 13:30	CRFQ 0211 GSD2200000014	11

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

State : **Country :** **Zip :**

Principal Contact :

Vendor Contact Phone: **Extension:**

FOR INFORMATION CONTACT THE BUYER
Melissa Pettrey
(304) 558-0094
melissa.k.pettrey@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

SOLICITATION NUMBER: CRFQ 0211 GSD2200000014
Addendum Number: 10

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[✓] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[✓] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[✓] Other

Description of Modification to Solicitation:

Addendum No. 10 is issued to provide the following information to vendors:

1. To revise the Bid Opening Date to February 24, 2022. The time remains 1:30pm.

2. To provide (as an answer to Technical Question #109) the opportunity to bidders to attend a non-mandatory site visit on February 9, 2022, beginning at 10:00am at 112 California Avenue (1st Floor Lobby).

3. To provide answers to all Technical Questions submitted by the deadline of January 27, 2022 which had not previously been answered by Addendum.

No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

CRFQ Question GSD2200000014, Addendum #10
East Campus Metal Buildings Project
Technical Questions and Answers Submitted through January 27, 2022

Question 93. We've been asked to supply cost information for the above referenced CRFG – East Campus Metal Buildings Project. The specification lists access control system software and equipment that is no longer available. It also lists additional hardware to support a stand-alone system. It is our understanding that the equipment should be an extension of the WV Department of Protective Services existing Lenel OnGuard access control system. We would like to request clarification for the access control system specified.

There is Avigilon CCTV system equipment listed in the specification. It is our understanding that this equipment should be an extension of the WV Department of Protective Services existing Avigilon CCTV system. We would also like to request clarification for the CCTV system specified.

Answer 93. The general intent of the project is revised so that both access control and cameras shall be installed as an extension of the existing WV Division of Protective Services campus security system, which is Lenel OnGuard for access and Avigilon CCTV for cameras. Specifications and drawings are being revised to accommodate this systemic revision plus several details, but will not be published until a subsequent addendum.

Question 94. Is Factory Mutual for the roof panels required for this project?

Answer 94. No.

Question 95. On Addendum 7, Answer 83, is it supposed to be worded 24 gauge FP wall LINER panels, and 24 gauge FP-12 SOFFIT panels are acceptable? Or will the exterior wall panels be a 24 gauge FP panel and the wall liner panels be a 24 gauge FP-12 Panel?

Answer 95.Use 22 gauge panel rib roof liner panels, 24 gauge FP wall panels, and 24 gauge FP-12 soffit liner panels.

Question 96. On the Open Storage Building and Bulk Storage Building, it is calling for Soffit Liner Panels on the underside of the purlins, which panel is to be used, the 36" wide 22 gauge panel rib roof liner panel or the 24 gauge FP-12 soffit panels?

Answer 96.Use the 24 gauge FP-12 Soffit Panels for the Soffit Liner Panels.

Question 97. In Building B (120'x32'x14')(Stag/WHS Stag) of the Warehouse/Grounds Building, will there be roof liner panels attached below the roof purlins above the interior buildout portion (Room #s 104,105,106 & Tools) of this building?

Answer 97.Roof liner panels are not required on concealed portions of the roof.

CRFQ Question GSD2200000014, Addendum #10
East Campus Metal Buildings Project
Technical Questions and Answers Submitted through January 27, 2022

Question 98. Can you submit the following?

- General Note 15, Sheet E-1-106Notes that all Data Racks…& terminations are to be included in the project. What size rack? Are we to include patch panels as well?

Answer 98. Refer to Specification Sections 271100 – Communications Equipment Room Fittings and 271500 – Communications Horizontal Cabling for information on racks and patch panels.

Question 99. Sheets E-1-902 & E-1-903

- Is the POE Managed Switch to be furnished & installed as part of this contract?
- Is the 2-Strand fiber from the switch to Building EB80 to be furnished & installed as part of this contract?

Answer 99. See Answer #93 regarding security details, which will be provided by subsequent addendum. The switch is to be furnished and installed. However, the reference to EB80 on the Drawing is definitely incorrect. All cameras will be required to connect to the Division of Protective Services server located in Bldg 3 on the Capitol Complex.

Question 100. At Column Line 9, you indicate Wall Type tag 1 similar to Note 9. Does this mean that the PEMB is to provide the Tag 1 and others will provide Tag 1 below the roof elevation between Warehouse and Maintenance Office.

Answer 100."Wall Type 1, Sim" means it is similar to Wall Type 1. The adjacent Construction Note 9 explains how the wall type is to be modified. If your question is "who provides what", ask your general contractor.

Question 101. Is it correct to note Wall Type Tags typical on the side of the wall it flags? For example, Tag 1 typical Note 9 applies to the west side of Column Line 9. To the East side of Column Line 9, Tag 7 applies between Column lines D and N. Is this correct?

Answer 101. "Wall Type 1, Sim" as adjusted by Construction Note 9 is continuous along the East wall of Warehouse 109. "Wall Type 7" is a Furred Wall, which also modifies Wall Type 1 along the Office Area.

Question 102. Is Waterproofing to be included at Storage and Bulk Storage? Is Waterproofing included at the Temporary Shop? Is a foundation drain required at the Temporary Shop?

Answer 102. Self-Adhered Sheet Waterproofing is to be applied to all perimeter foundations of the Warehouse/Grounds Building from bottom of grade beam to 1" below grade and Mail Room from top of

footing to 1" below grade. Neither foundation drain nor foundation waterproofing is required at the temporary shop.

Question 103. Note 8 on sheet p-1-901 WG and 6/p-502 calls for the Air Compressor WD1 to be Owner Provided. WD1 on Sheet A-1-701 WG states this equipment is Provided and Installed CC. Which is correct?

Answer 103. Air Compressor WD1 is to be provided and installed by the Contractor.

Question 104. Addendum 7 Question 78 asks if underslab perimeter insulation is required. The answer #77 instructs us to coordinate a sub-consultant. What is the intent of this answer?

Answer 104. Provide under-slab perimeter insulation at the Warehouse Grounds Building and the Mail Room Building.

Question 105. Question 29 in Addendum 5 asks for 3 types of signs. Plaque is not in contract. Dimensional letters are by Gemeni. The answer to panel signs was not provided. We need a type and location.

Answer 105.Plastic Panel signage is required at the Men's Restroom, Women's Restroom, and for the Warning Sign (Detail 4/A-1-500, no braille is required at the Warning Sign).

Question 106. Question 38 answer was that we were to provide a building permit. We assume that the permit cost would be paid by the Contractor? Is this correct?

Answer 106. Any permits and/or fees which are necessary to undertake the project are the responsibility of the bidder/contractor.

Question 107. If we have a building permit, then the compliance to the IBC and City of Charleston is implied, including inspections. Is this correct?

Answer 107. Compliance with all local ordinances applicable to the project is the responsibility of the Vendor. Any required compliance with IBC is evidenced in the Project Plans.

CRFQ Question GSD2200000014, Addendum #10
East Campus Metal Buildings Project
Technical Questions and Answers Submitted through January 27, 2022

Question 108. Question 48 answer provides a location for the SHEET WATERPROOFING in a building. Are these locations for only the WG and MR? Is the sheet waterproofing required at the Temporary Shop?

Answer 108. No.

Question 109. I need to set up a site visit with an asbestos contractor. They need to get into the existing Mail Room. Can you point me in the right direction?

Answer 109. **A secondary site visit is scheduled for 10:00am on Wednesday, February 9, 2022, assembling in the 1st Floor Lobby of Building Four (112 California Avenue).** A walkthrough of the jobsite will follow, at which point an allowance of time will be made for bidders to examine the Mail Room. However, if a bidder wishes to access the roof (the area in which the specifications indicate quantities of asbestos-containing materials), they should be prepared to supply their own access. Any access to the roof to be granted shall be done only to the Agency's satisfaction regarding safety protocols (a bidder may be denied access if not meeting all safety requirements). A secondary site visit allows only an opportunity for bidders to review the jobsite (to photograph, take measurements, etc.). There will be no opportunity to ask or receive answers to technical questions. Any verbal representations made at the site visit will not be binding to the solicitation or any subsequently awarded contract. Attendees may be required to satisfy all Agency requirements for COVID-protocol safety (it is advised that social distancing be practiced and masks be worn with CDC-defined close contact is unavoidable).

	Department of Administration Purchasing Division 2019 Washington Street East Post Office Box 50130 Charleston, WV 25305-0130	**State of West Virginia** **Centralized Request for Quote** **Construction**

Proc Folder: 773207 **Doc Description:** Addendum No. 7 East Campus Metal Buildings Project **Proc Type:** Central Purchase Order			**Reason for Modification:** Addendum No. 7
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2021-12-16	2022-01-13 13:30	CRFQ 0211 GSD2200000014	8

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

State : **Country :** **Zip :**

Principal Contact :

Vendor Contact Phone: **Extension:**

FOR INFORMATION CONTACT THE BUYER
Melissa Pettrey
(304) 558-0094
melissa.k.pettrey@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

SOLICITATION NUMBER: CRFQ 0211 GSD2200000014
Addendum Number: 7

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[✔] Modify bid opening date and time

[✔] Modify specifications of product or service being sought

[✔] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[✔] Other

Description of Modification to Solicitation:

Addendum No. 7 is issued to provide the following information to vendors:

1. To provide answers to the portion of Technical Questions received through December 2, 2021, per Attachment A. Questions submitted since that date will be addressed by subsequent addendum.

2. To provide clarifications to and to add drawings (which are also included as a separate, downloadable attachment in wvOasis) per Attachment A.

3. To revised the deadline for submitting Technical Questions to December 29, 2021, by 3:00pm.

4. To revise the Bid Opening Date to January 13, 2022. The time remains 1:30pm.
No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

See Attached:

- **"CRFQ 0211 GSD2200000014 East Campus Metal Building Project ADDENDUM No. 7 12/15/2021"**

- **"CRFQ 0211 GSD2200000014, Addendum 7East Campus Metal Building Project Technical Questions and Answers Submitted through December 2, 2021"**

- **"CRFQ 0211 GSD2200000014 Addendum 7 Drawings**

CRFQ 0211 GSD2200000014
East Campus Metal Building Project

ADDENDUM NO. 7
12/15/2021

A. Clarifications

1. The awarded Contractor will be provided revised sets of Construction Drawings and Project Manual incorporating revisions made by addendum.

B. Questions and Answers

1. See partial bidder questions and answers, attached (questions 58A - 92).

C. Modifications

1. ADD Attached Drawing A-1-700, Revised Equipment Schedule.

2. ADD Attached Drawing A-1-701, Revised Equipment Schedule and deleted Phase 1 Equipment Plan.

3. Drawing E-1-101, Clarifications for lighting controls for the following spaces:

   a. Whs Stag 102, Warehouse 107

      1) Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual control via the switches shown. Switches shown for these spaces shall be low-voltage type with capability of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5

      2) Sequence of operations for these spaces are manual control only from low-voltage switches. Personnel shall be capable of providing "on", "off", "raise" and "lower" controls for luminaires in each of these spaces.

   b. Receiving 100, Refr Stor 101a, Storage 104

      1) Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual and automatic control via the switches and occupancy sensors shown. Switches shown for these spaces shall be low-voltage type with capability of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5

2) Sequence of operations for these spaces are manual "on" via associated switches and automatic "off" via time delay after space has been unoccupied as indicated by occupancy sensor. In addition, personnel can manually turn lighting "off" and provide manual dimming via the associated low-voltage switches.

c. Office 105

1) Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual and automatic control via the switches and occupancy sensors shown. Switches shown for these spaces shall be low-voltage type with capability of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5

2) Sequence of operations for these spaces are manual "on" via associated switches and automatic "off" via time delay after space has been unoccupied as indicated by occupancy sensor. In addition, personnel can manually turn lighting "off" and provide manual dimming via the associated low-voltage switches.

d. Exterior Lighting

1) Building mounted and pole mounted lighting shall be controlled by combination photocell and lighting contactor. In addition, a 3-position switch shall provide manual "on/off" and automatic "on/off" control via photocell for the associated lighting circuits (ckt H1-22, this sheet). Refer to Detail 3, Sheet E-501 for additional information. Lighting contactor and 3-position switch shall be in Mechanical Room 109. Photocell shall be building exterior mounted.

2) An unswitched lighting conductor is required for the luminaires containing an integral emergency battery inverter. During normal power failure, these luminaires shall be "on" regardless of photocell control.

4. Drawing E-1-102, Clarifications for lighting controls for the following spaces:

a. Surplus 111, Grounds Storage 123, Maintenance Shop 125, Grounds Mechanics Shop 126

1) Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual

control via the switches shown. Switches shown for these spaces shall be low-voltage type with capability of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5

2) Sequence of operations for these spaces are manual control only from low-voltage switches. Personnel shall be capable of providing "on", "off", "raise" and "lower" controls for luminaires in each of these spaces.

b. Breakroom 118

1) Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual and automatic control via the switches and occupancy sensors shown. Switches shown for these spaces shall be low-voltage type with capability of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5

2) Sequence of operations for these spaces are manual "on" via associated switches and automatic "off" via time delay after space has been unoccupied as indicated by occupancy sensor. In addition, personnel can manually turn lighting "off" and provide manual dimming via the associated low-voltage switches.

c. Corridor 112, Men 114

1) Sequence of operations for these spaces are manual "on" via associated switches and automatic "off" via time delay after space has been unoccupied as indicated by occupancy sensor. In addition, personnel can manually turn lighting "off" via the associated low-voltage switches.

d. Exterior Lighting

1) Building mounted and pole mounted lighting shall be controlled by combination photocell and lighting contactor. In addition, a 3-position switch shall provide manual "on/off" and automatic "on/off" control via photocell for the associated lighting circuits (ckt H1-24, this sheet). Refer to Detail 3, Sheet E-501 for additional information. Lighting contactor and 3-position switch shall be in Mechanical Room 109. Photocell shall be building exterior mounted. Please note: these are the same lighting contactor, switch, and photocell referenced in clarifications for Sheet E-1-101 above.

2) An unswitched lighting conductor is required for the luminaires containing an integral emergency battery inverter. During normal power failure, these luminaires shall be "on" regardless of photocell control.

5. Drawing E-1-103, Clarifications for receptacle/lighting interconnection.

   a. In Office 105, switched receptacles shall be controlled by a power pack that is connected to the lighting controls for this room. Receptacles shall be controlled "on" and "off" with the same control sequence as the lighting for this room.

6. Drawing E-1-106, Clarifications for Telecommunications System.

   a. In Security Room 119, provide 1" conduit with telecommunications bonding conductor (#1 AWG) from TMGB (Keynote #6) to the Main Ground Bar (Mechanical 109).

   b. Two (2) 2" conduit existing building (Plan South) referenced by Keynote #7 shall be spare. Cap conduit 5' beyond building footprint and provide utility marker for future use.

7. Drawing E-2-100, Clarifications for Open Storage and Bulk Storage Buildings:

   a. Open Storage and Bulk Storage Lighting

      1) Canopy and building mounted lighting shall be controlled by combination photocell and lighting contactor. In addition, a 3-position switch shall provide manual "on/off" and automatic "on/off" control via photocell for the associated lighting circuits (ckt L3-1, L3-3 and L3-5). Refer to Detail 4, Sheet E-501 for additional information. Lighting contactor shall be located adjacent to Panelboard L3 while the 3-position switch shall be located in Open Storage Building. Expand support rack for Panelboard L3 (Keynote #1) to accommodate lighting contactor. Field coordinate final switch location with Owner. Photocell shall be building exterior mounted.

   b. Panelboard L3 shall be NEMA 4X stainless steel in lieu of NEMA 3R.

8. Drawing E-3-101, Clarifications for lighting controls for the following spaces:

   a. Lobby 101, Mail Room 102, Break Room 108, Office 109, Shipping 110

      1) Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual and automatic control via the switches and occupancy sensors shown. Switches shown for these spaces shall be low-voltage type with capability

of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5

2) Sequence of operations for these spaces are manual "on" via associated switches and automatic "off" via time delay after space has been unoccupied as indicated by occupancy sensor. In addition, personnel can manually turn lighting "off" and provide manual dimming via the associated low-voltage switches.

b. Exterior Lighting

1) Building mounted lighting shall be controlled by combination photocell and lighting contactor. In addition, a 3-position switch shall provide manual "on/off" and automatic "on/off" control via photocell for the associated lighting circuit (ckt L4B-7, this sheet). Refer to Detail 5, Sheet E-5001 for additional information. Lighting contactor and 3-position switch shall be in Mechanical Room 103. Photocell shall be building exterior mounted.

2) An unswitched lighting conductor is required for the luminaires containing an integral emergency battery inverter. During normal power failure, these luminaires shall be "on" regardless of photocell control.

3) Please note: the OLF4AE plan east shall be shaded (meaning emergency battery backup is required).

9. Drawing E-3-103, Clarifications for Telecommunications System:

a. All data outlets in this building shall be D1 type.

b. In Electrical Room 104, provide 1" conduit with telecommunications bonding conductor (#1 AWG) from TMGB (Keynote #6) to the Main Ground Bar (Sheet E-3-102).

c. One (1) 4" conduit existing building (Plan South) referenced by Keynote #15 shall be spare. Cap conduit 5' beyond building footprint and provide utility marker for future indication.

10. Drawing E-500, Clarification for Exterior Lighting Control.

a. Detail 5, Mailroom Bldg – Exterior Lighting Control. Lighting contactor shall have 120V coil, minimum of two (2) 30A poles, and provided with NEMA 1 enclosure.

11. Drawing E-501, Clarification for Exterior Lighting Control.

a. Detail 3, Warehouse Bldg – Exterior Lighting Control. Lighting contactor shall have 277V coil, minimum of six (6) 30A poles, and provided with NEMA 1 enclosure.

b. Detail 4, Bulk/Open Storage Bldg – Exterior Lighting Control. Lighting contactor shall have 120V coil, minimum of three (3) 30A poles, and provided with NEMA 4X enclosure.

12. Drawing E-502, Clarification for Trench Details.

a. Detail 5, Primary Trench Detail and Detail 6, Secondary Trench Detail. Trench details are for reference only and Contractor shall refer to one-line diagrams for specifical conduit quantities and sizes.

13. Drawing E-703, Panelboard Schedules.

a. Panelboard L3 shall be provided NEMA 4X stainless steel enclosure in lieu of NEMA 3R enclosure.

End of Addendum 7

CRFQ 0211 GSD2200000014, Addendum 7
East Campus Metal Buildings Project
Technical Questions and Answers Submitted through December 2, 2021

Question 58A.What is control intent of power pack to line voltage switches without sensors?

(Building 1 – Warehouse: Whs Stag 102, Warehouse 107, Surplus 111, Grounds Storage 123, Maintenance Shop 125 & Grounds Mechanics Shop 126)

Answer 58A. **Power pack shall provide control for the lighting within the spaces referenced. Each power pack shall provide 0-10VDC dimming (refer to Specification Section 260923). Power packs shall be used for manual control via the switches shown. Switches shown for these spaces shall be low-voltage type with capability of "on", "off", "raise" and "lower." Provide connections as required from switches to associated power pack. Provide 0-10VDC dimming conductors from power pack to each luminaire as defined by General Note #5.**

Question 59. Is there a sequence of operations to validate the switching control intent in spaces with occupancy sensors because the switches show line connecting to power packs?

(Using line voltage switches is a possible function with primary auto on/off via occupancy sensor and secondary manual off via switch that does require switch to be in the on position for primary to function because lights will remain off if the switch is in the off position.)

Answer 59. **Sequence of operations is manual control only from low-voltage switches. The occupant shall be capable of providing "on", "off", "raise" and "lower" controls for luminaires in each of the spaces refenced in Question 58.**

Question 60. Can regular (rebar) splices be used in lieu of the dowel bar extenders shown on section 2/S-1-301?

Answer 60. **Rebar splices that satisfy the lap length requirements on the structural notes sheet may be substituted.**

Question 61. Sheet C-0-101; Pole shown in the middle of the lot as 'existing to remain'. Not shown in new work

Answer 61. **This light pole to remain is mis labeled. Remove the light pole and conduit back to the day care building as part of Add. Alternate No. 1.**

Question 62. Sheet C-0-101; is 'Remove Utility Pole' near the Block Building Main Shop to be removed by the utility?

Answer 62. **No. The Contractor shall remove the pole.**

Question 63. Sheet C-0-101; is 'Remove Pull Box & Duct Bank' and 'Remove Utility Pole & Underground Electric' by the utility or the contractor?

Answer 63. **No. The Contractor shall remove the pull box and duct bank.**

Question 64. Lighting Controls: What is control intent of power pack to line voltage switches without sensors?

Answer 64. **Sequence of operations is manual control only from low-voltage switches. The occupant shall be capable of providing "on", "off", "raise" and "lower" controls for luminaires in each of the spaces refenced in Question 58.**

CRFQ 0211 GSD2200000014, Addendum 7
East Campus Metal Buildings Project
Technical Questions and Answers Submitted through December 2, 2021

Question 65. (Building 1 – Warehouse: Whs Stag 102, Warehouse 107, Surplus 111, Grounds Storage 123, Maintenance Shop 125 & Grounds Mechanics Shop 126). Lighting Controls: Is there a sequence of operations to validate the switching control intent in spaces with occupancy sensors because the switches show line connecting to power packs?

Answer 65. **See Answers to Questions 58 and 59.**

Question 66. (Using line voltage switches is a possible function with primary auto on/off via occupancy sensor and secondary manual off via switch that does require switch to be in the on position for primary to function because lights will remain off if the switch is in the off position.) Lighting Controls: Sheets E-1-101 & E-1-102 do not show any switch designations.

Answer 66. **See Answers to Questions 58A and 59.**

Question 67. Sheet E-1-900 shows primary conduits as (2) 5" schedule 80 & Detail 5/E502 shows (2) 4" schedule 80.

Answer 67. **Provide two (2) 5" schedule 80 conduits as referenced on E-1-900.**

Question 68. Sheet E-1-900 shows secondary conduits as (3) 3" and Detail 6/E502 shows (5) 4"

Answer 68. **Provide three (3) 3" schedule 40 conduits as referenced on E-1-900.**

Question 69. Sheet E-1-900 lists ATS #1 & ATS #2 as 'freestanding. On Sheet E-1-400 they appear to be wall mounted

Answer 69. **Either freestanding or wall mounted ATS is acceptable, coordinate with ATS manufacturer. If freestanding, Contractor shall provide concrete housekeeping pad as referenced in Specification Section 263213.**

Question 70. Sheet E-1-900 General Note 6 refers to a Lightning Protection System. Does not appear to be specified

Answer 70. **Lightning Protection System for Building Structures is not part of the project.**

Question 71. They have a coupler detail out of caissons for the hooked bars. This is about a $70,000.00 add item. If they would go with regular splices it would be about $10,000 worth of rebar. Can we go with regular splices instead of using the coupler detail?

Answer 71. **Rebar splices that satisfy the lap length requirements on the structural notes sheet may be substituted.**

Question 72. Flood Coverage for the project will be approximately $100,000 per building with a $25,000 deductible each on this project. Can this please be reviewed by the Owner group and possibly carried by the Owner? This would be an extra $200,000 plus we would have to include in our estimate that the Owner may be able to get a better rate or already has coverage. Please advise.

Answer 72: **Builder's Risk insurance is required on this project. The Owner will not carry any part of that insurance, including flood coverage.**

Question73. For the Alternate work on the project, is all site utilities, site electric, demolition, etc. for those areas included in the Alternates? The only sheet the designates the Alternate areas is G-003, none

of the other sheets clarify where work should stop regarding the Base Bid and Alternates. This is making it difficult to clearly understand what to include in the breakout pricing.

Answer 73.. **See Answer 35 from Addendum 5.**

Question 74. Detail 3/S-1-301 shows a slab joint over a grade beam. This section is on Building Line 11. Per the Architectural Drawings in this area, the wall tag 1 is an Exterior metal building wall Similar. What are the similar details and not similar details. For example, the exterior walls are on an 4" x 8"curb. 3/S-1-301 does not show a curb. Is this correct?

Answer 74. **Yes.**

Question 75. Refer to Question 18. See attached highlighted images of Sheet A-1-700 and A-1-701 where missing information is required.

Answer 75. **See Revised Sheets in Addendum 6.**

Question 76. The Sheet A-1-100 shows both FE and FF fire extinguishers. The Sheets A-1-101 & 102 faintly show FE. The specifications indicate only FE are used. Which is correct?

Answer 76. **Only type FE fire extinguishers are used. Add fire extinguishers at Columns 9M and 10D, beside Door 107C in Surplus 111, and in Break Room 118 beside the north cabinetry.**

Question 77. On Sheet A-1-100 outside the Building at Column Line 2 is unidentified. On Sheet A-1-101 same location, is Note 10 for a canopy – no identification on site. Sheet P-1-103 same location no identification. On Sheet A-1-201 it shows a propane fence. There is nothing on the Site Utility drawing. What is the intend here?

Answer 77. **The propane cabinet sits on a concrete slab. See notes 10 and 11/A-1-101.**

Question 78. On Sheet A-3-001 shows a detail of under slab perimeter insulation. The WG sheets do not indicate under slab perimeter insulation, but it is shown in details without any information. What are we to price in this location on the WG drawings?

Answer 77. **Coordination of sub-consultant scope of work is the General Contractor's responsibility.**

Question 79.A continuation to the question of payment of construction testing Section 014000 paragraph 1.9 A.2 states "Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders." Will we be receiving a Change Order for this work?

Answer 79. **All testing and inspection are included in the bid. No change order will be provided for testing of work included in the bid.**

Question 80. If the Contractor is to provide and pay for Testing can you provide in writing via Addendum that Terracon will be an acceptable provider of this service.

Answer 80. **Terracon is an acceptable provider for testing services subject to meeting the specified requirements.**

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Question 81. In Section 133419 paragraph 3.9 A. is states "Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports." Please advise with the clarification requested regarding the Special Inspector.

Answer 81. **Testing and special inspection will be paid for by the Contractor.**

Question 82. Please reconsider Cornell as an approved manufacturer for the overhead doors. Adden #5, Answer 7, Cornell was not approved as an overhead door supplier because of insufficient documentation. I must have forgotten to send it on my first try. See product data & warranty information attached. I can supply Wayne Dalton (listed as approved in specs) but they are having major production issues, we've been using Cornell as our primary supplier since the pandemic began effecting supply issues.

Answer 82. **Cornell is an acceptable alternative manufacturer for overhead doors subject to meeting the specified requirements.**

Question 83. Regarding liner panel gauges:

A. Addendum #5, question and answer #41 calls for a panel rib style **roof liner** panel. It calls for 0.036 thickness (20 gauge). We can't roll panel rib with that thickness. The Thickest gauge we can roll for panel rib is 22 gauge. **We request that they change the roof liner panel gauges to 22 gauge.**

B. Addendum # 5, question and answer to #41 also calls for a **wall liner** panel with flush profile with exposed fasteners, 12" width, and 1 ½" panel thickness. It also calls for .036 thickness (20 gauge). We don't have any panel that matches that profile (flush, exposed fastener, 12" X 1 ½"), and we also don't have any liner panel that we provide that is 0.036" thickness. We can provide PR, VR, or RPR in 22 gauge, or we can provide FP-12 in 24 gauge. **We request that the wall liner panels be changed to 22 gauge PR, VR, or RPR, or 24 gauge FP-12.**

C. Specification 133419/2.6 call for metal "soffit" panels that are VP FP-12, but calls for them to be 0.036 thickness. We provide this panel as 24 gauge. 0.036 is 20 gauge. **We request it be changed to 24 gauge, and/or we request that it be changed to whatever the roof liner panel (item "a" above) is.**

Answer 83. **After further review, 22 gauge panel rib roof liner panels, 24 gauge FP wall panels, and 24 gauge FP-12 panels are acceptable.**

Question 84. Drawing A-1-600 finish schedule list a lot of walls with MWP/Gyp but sections show metal liner panels in almost all locations. **We request clarification on which is required.**

Answer 84. **See plans for wall types.**

Question 85. Drawing A-1-101, A-1-104, Show the receiving/Surplus building over lapping the warehouse building at line 3.1. This will require a cricket and possible weather tightness issues. **Is there any leeway on how this can be framed?**

Answer 8: **No, not at this time.**

Question 86. Drawing A1-104. The canopies with 8' (2) and 10' (1) projection cannot be walk door type canopies. These will require structural canopies without support rods. **We request that these be changed to 4' or 5' projections if possible as those can be done as preassembled canopies.**

Answer 86. **Provide as designed.**

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Technical Questions and Answers Submitted through December 2, 2021

Question 87. Confirm that open storage and bulk storage building will receive insulation and wall/ roof liner where applicable.

Answer 87. **Open storage and bulk storage do not require insulation.**

Question 88. Per the revised pricing sheet included in Addendum 5 we are to add the base bid, alternates and unit prices together for a Total Bid Amount. It is pretty uncommon to add unit prices to bid amounts. Please confirm that you want us to add the unit pricing for a Total Bid Amount.

Answer 88.Vendor shall add base bid, alternates, and unit prices together to calculate Total Bid Amount, per instructions on Pricing Page.

Question 89. Can Chief Industries be approved as a qualified manufacturer for the Pre-Engineered Metal Building? Chief has been manufacturing buildings since 1965 and is an MBMA member and also AISC certified, please use the following link for more information on Chief Industries.
https://chiefbuildings.com/

Answer 89. **Chief Industries is an acceptable manufacturer for Pre-Engineered Metal Buildings subject to meeting the specified requirements.**

Question 90. Can MBCI's FW120 flat profile wall panel be an acceptable substitution for the Impressaclad wall panel? The FW120 panel offers a flat embossed profile and is a 20 gauge panel. Attached is a brochure of the panel with more information.

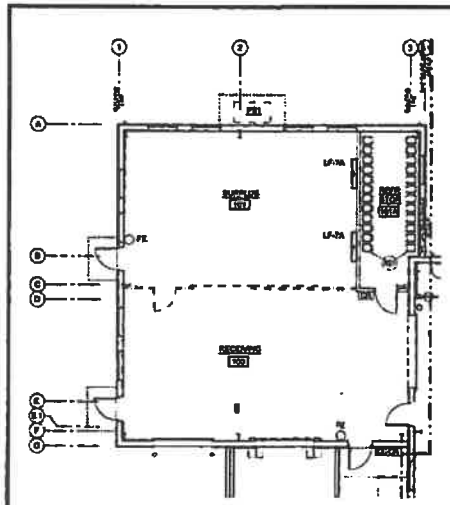
Answer 90. **A complete system from one metal building manufacturer is required for this project.**

Question 91. If MBCI's FW120 panel is approved, is it acceptable to use for the wall liner panels also?

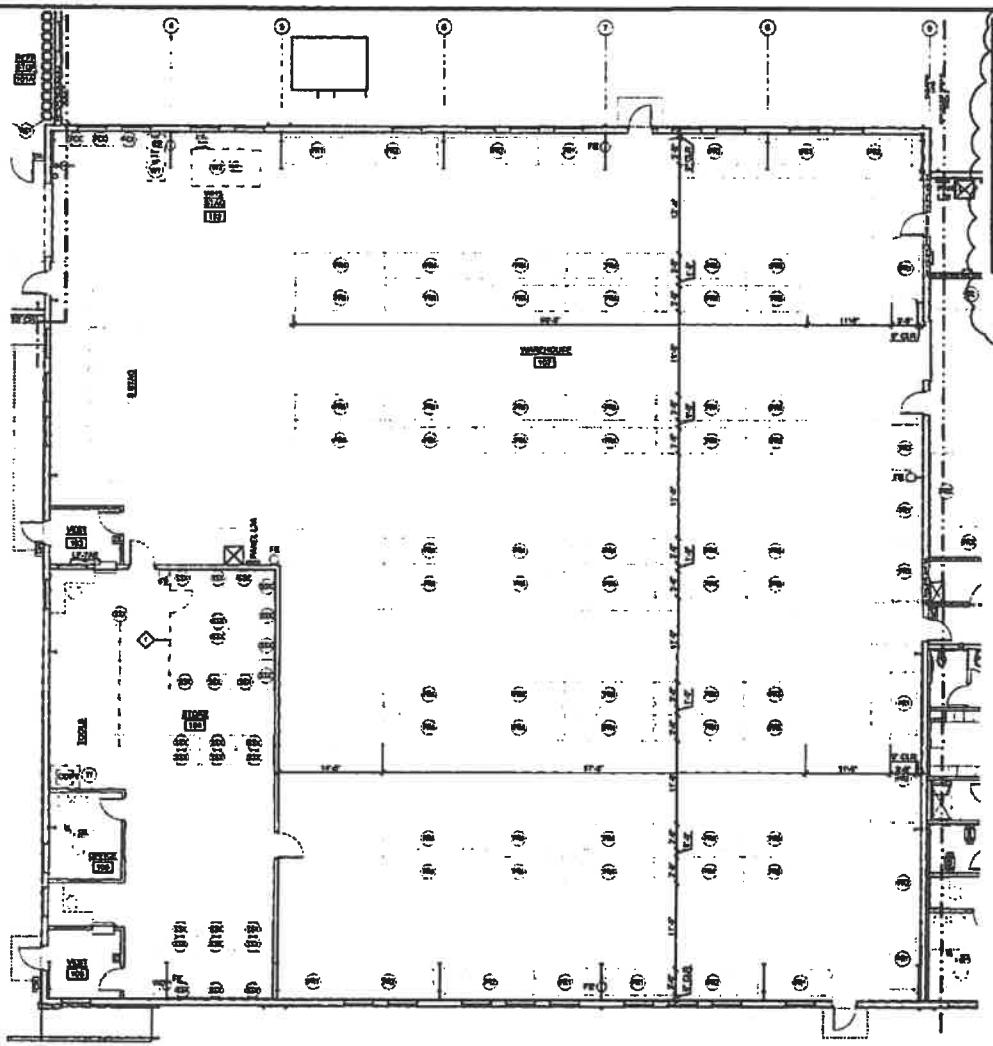
Answer 91. **A complete system from one metal building manufacturer is required for this project.**

Question 92. On the East Campus Metal buildings project A-1-101 & A-1-102 there are non-standard metal stud sizes indicated in wall types. Types 3 & 9 indicate 5-3/8" & type 6 indicates 5-5/8". As our metal stud manufacture doesn't offer these sizes, is 6" metal studs ok for these wall types?

Answer 92. **6" metal studs are acceptable substitutes for 5"+ studs, assuming all other specifications remain the same. All coordination issues arising from the change are the Contractor's responsibility.**



1 EQUIPMENT PLAN AREA 'A'
SCALE: 1/8" = 1'-0"



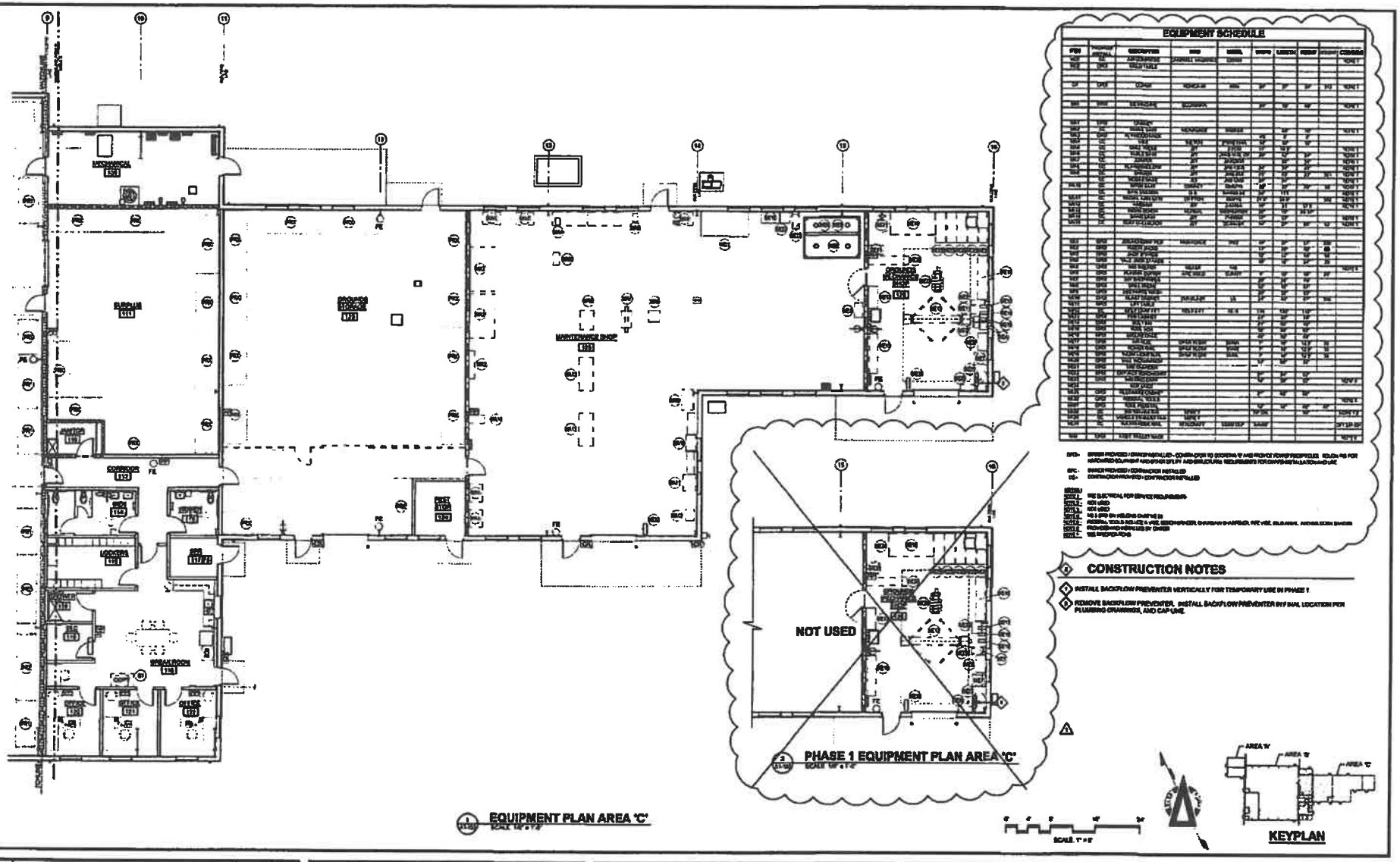
1 EQUIPMENT PLAN AREA 'B'
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

1. REMOVING AND CAPPING BY OWNER

EQUIPMENT SCHEDULE

MARK	QTY	DESCRIPTION	SIZE	WIDTH	DEPTH	HEIGHT	WEIGHT	REMARKS
FE	EACH	FIRE EXTINGUISHER						NOTE 1
PR	EACH	PALLET RACK	NOTE 3		3'-6"	12'-6"		NOTE 3
PR	EACH	PALLET RACK	NOTE 3		3'-6"	12'-6"		NOTE 3
PR	EACH	PALLET RACK	NOTE 3		3'-6"	12'-6"		NOTE 3
PR	EACH	PALLET RACK	NOTE 3		3'-6"	12'-6"		NOTE 3
PR	EACH	PALLET RACK	NOTE 3		3'-6"	12'-6"		NOTE 3
WP	EACH	WIRE PALLET RACK						NOTE 4



REVISIONS	SIZE	BY
1 REVISED EQUIPMENT SCHEDULE AND PHASING	11/15/21	PAW

Chapman Technical Group
AIRPORT PLANNING / DEVELOPMENT
ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING
St. Albans, WV (304) 727-1601
Beckley, WV (304) 573-2814
www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
FLOOR PLAN AREA 'C'
EQUIPMENT LAYOUT AND SCHEDULE

JOB NUMBER	19027
DATE	AS NOTED
ISSUED	AUGUST 6, 2021
DRAWN BY	DMD
REVIEWED BY	PAW
CHECKED BY	PAW
SHEET NO.	A-1-701
REVISION	1

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Request for Quote
Construction

Proc Folder: 773207 **Doc Description:** East Campus Metal Buildings Project **Proc Type:** Central Purchase Order			**Reason for Modification:**
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2021-10-05	2021-11-16 13:30	CRFQ 0211 GSD2200000014	1

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

State : **Country :** **Zip :**

Principal Contact :

Vendor Contact Phone: **Extension:**

FOR INFORMATION CONTACT THE BUYER
Melissa Pettrey
(304) 558-0094
melissa.k.pettrey@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

SOLICITATION NUMBER: CRFQ 0211 GSD2200000014
Addendum Number: 5

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[✔] Modify bid opening date and time

[✔] Modify specifications of product or service being sought

[✔] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[ ] Other

Description of Modification to Solicitation:

Addendum No. 5 is issued to provide the following information to vendors:

1. To provide answers to the portion of Technical Questions received through November 5, 2021, per Attachment A. Questions submitted since that date will be addressed by subsequent addendum.

2. To provide clarifications, specification and drawing revisions, per Attachment A.

3. To revised the deadline for submitting Technical Questions to November 29, 2021, by 3:00pm.

4. To revise the Bid Opening Date to December 21, 2021. The time remains 1:30pm.

No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

See Attached:

- **Addendum No. 5 Technical Questions and Answers Through November 5, 2021**
- **Addendum No. 5 Summary**
- **Addendum No. 5 Revised Pricing Page**
- **Addendum No. 5 Project Manual Specifications Modifications**
- **Addendum No. 5 Drawings Modifications**

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NOTE: All products for which substitution requests are made prior to the bid opening are still required to be approved through the Submittal Procedures, as indicated in Division 1 of the Project Manual.

Question 1: Lochinvar is listed as acceptable, we stock Lochinvar here in Charleston. We also stock the DWH1 version of the BTH120 –> the SWR125. Spec attached. My question is, would this Lochinvar unit be acceptable? It is not offered in ASME, but we can offer an extended warranty for total of 5yr on the tank (3yr is std for everyone), in lieu of ASME rated tank.

Answer 1: Lochinvar is acceptable. Must provide extended warranty (total of 5 yr), in lieu of ASME rating.

Question 2: On the L1- it shows a Delta Paradigm HW fct (which doesn't seem to be something Delta makes)--- would you all consider the T&S fct attached, the EC3103? We also stock this faucet here in Charleston. To get the correct gpm, we can change aerator to 0.5gpm. It's also capable of battery, plug-in, or HW straight out the box. Lastly, the sensor eye is replaceable- meaning maintenance staff down the road can replace the sensor for $50 instead of tossing a $450 fct and replacing the whole thing.

Answer 2: Delta Paradigm is manufactured by American Standard. T&S single lever faucet is acceptable with adjustment to match GPM listed in schedule.

Question 3: BS1- keeping same faucet manufacturer- T&S, B1172-07-133 kitchen sink faucet…. For consideration.

Answer 3: This is not acceptable. GPM does not match and distance from deck to bottom of faucet is not as specified.

Question 4: On Sh1- we work well with Clarion Bathware out of PA. Spec attached, MP6333bf34. They will install the handheld shower and trim at the factory and ship complete. They also ship pretty quick. Attached is a near identical to Freedom listed on plans. Of note, I think Freedom showers is more of an online retailer to elderly facilities.

Answer 4: This is not acceptable. The dimensions of the shower are larger than the opening that has been provided and what is shown on the schedule.

Question 5: Lastly, for UR1 & WC1/a- I'm sure Sloan is acceptable, but I attached the specs anyway (111sfsm-hw & 186sfsm-hw)---we also stock this in Charleston. They even come with a true mechanical override even if power failure.

Answer 5: Sloan is acceptable. Individual models must meet specifications and must be submitted for approval post-award.

Question 6: Could you request a Basis-of-Design from Architect/GSD for Section 105500 - Private-Delivery Postal Specialties for bidding purposes?

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Answer 6: The mail boxes were designed around Florence Corporation Series 1700 Horizontal, rear-loading, recessed mounted, anodized aluminum mail box system utilizing (7) 170096 units with (6) 1705 compartments and (6) 1707 compartments, each (42 of each compartment total), and standard cam locks.

Question 7: Please approve Comell as approved supplier for the overhead doors (product data attached.

Answer 7: Insufficient documentation was provided to determine equality of product and warranty. Cornell cannot be approved as an acceptable alternative manufacturer for overhead doors at this time.

Question 8: Will you approve Soprema, Colphene, Elastocol Stick Zero, per attached documentation?

Answer 8: Soprema USA is acceptable as an alternative manufacturer for Self-Adhering Sheet Waterproofing, subject to meeting the specified requirements.

Question 9: From Sections 111313, 111316, and 111319, will you please approve McGuire Edge-Of-Dock Leveler, Rigid Dock Shelter & Automatic Truck Restraint?

Answer 9: McGuire is an acceptable alternative manufacturer for dock equipment subject to meeting the specified requirements.

Question 10: A model specific bumper will be supplied with the Edge-Of-Dock lever: are the bumpers specified in 111313, 2.1 required at another location (these bumpers will not work with the Edge-Of-Dock Leveler)? If so, where and how many?

Answer 10: The intent of this section is to provide dock bumpers coordinated with edge-of-dock leveler to be supplied. This is the only location where dock bumpers will be required.

Question 11: From Section 083323; Doors #102A & 107D are interior doors, do they require insulation? windows?

Answer 11: Insulation is required on overhead doors 102A and 107D, vision panels are not required.

Question 12: Is the Mailroom Door #110C to be manually operated?

Answer 12: Yes.

Question 13: Please clarify if the State is wanting the GC to handle the asbestos abatement in the block building, or will the State take this part of the work and have their Abatement company that they have a contract with handle that abatement.

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Answer 13: Per Specifications Section 028200, the Vendor will be responsible for all asbestos abatement required for the project, through the use of an Abatement Contractor (subcontractor), if necessary. The State will not utilize their existing contract/contractor for any work included in this project.
The existing Mail Room has already been partially demolished and the total quantities of asbestos abatement shall be adjusted in accordance with the revised Table of Quantities on revised Specification Section 028200, Paragraph 1.1.2 (attached).

Question 14: Can a substitution of helical piers be used in place of the auger cast piles?

Answer 14: No. Helical piers are not equal to auger cast piles.

Question 15: In the Spec 133419 Metal Building Systems (2 a below)- The industry standard system for the specified metal roof and wall panels is a two-coat fluoropolymer. The exterior finish spec says three coats. Is the standard two coat fluoropolymer system the finish intended for the project?

Answer 15 : Alternative systems for coating roof and wall panels will be considered if they provide the required warranties and have a similar appearance as determined by the Architect.

Question 16: The dock equipment specs call out for an edge-o-dock leveler, but also mention a pit style dock leveler. Additionally, the drawings A-1-200 shows a pit dock leveler as well. Can we get clarification on this spec?

Answer 16: The dock leveler will be a manual edge of dock leveler.

Question 17: We were told at the pre-bid meeting that there is a cover sheet we need to use if we submit the bid through OASIS. We cannot find the cover sheet in the RFQ. Can you give us a copy or let us know how to find it?

Answer 17: By Addendum #3, a copy of the Pricing Page (i.e., not a "cover sheet") was made to be a requirement to be submitted with the Bid.

Question 18: Please find attached our submittal for the lighting fixtures we are proposing for the above named project.

Answer 18: Signify Brand fixtures are acceptable as an alternative manufacturer for Lighting Fixtures, subject to meeting the specified requirements. Insufficient information is available to determine equality of NLS Lighting products and warranty. NLS Lighting cannot be approved as an acceptable alternative manufacturer for light fixtures at this time.

Question 19: Addendum # 3 extended the Bid to November 30. This is one business day after the Thanksgiving holiday. We would request that the bid date be extended into the week of December 6 through December 10. This allows all resources to be back in their respective offices and over the holiday. Based on our history of bidding during the holiday season, this is a reasonable request.

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Answer 19: By Addendum #4, the Bid Opening was extended to December 14, 2021

Question 20: Can the Owner perform the Special Inspections and Testing? Per IBC Code "the approved agency shall be independent from the Contractor responsible for the work being inspected." Also it is not possible to know the cost of the special inspections to be included in the bid.

Answer 20: No. This remains the Contractor's responsibility.

Question 21: Can a Special Inspections Allowance be provided for the Contractors to include in their bids?

Answer 21: No.

Question 22: Per the drawings and specifications there are to be 5 pile load tests. How many 16" versus 18" pile tests are to be performed?

Answer 22: **Provide (3) – 16" diameter load tests and (2) – 18" diameter load tests.**

Question 23: Sheet C-0-107 plan notes references "See Detail B this sheet". This is not exist (sic). Please advise.

Answer 23: See Detail Sheet C-0-506

Question 24: Sheet C-0-107 plan notes references "See Detail A this sheet". This is not exist (sic). Please advise.

Answer 24: See Detail Sheet C-0-506

Question 25:Sheet C-0-107 plan notes references "Note 43 temp water" pointing to an electrical conduit for site lighting. Please advise.

Answer 25: The leader has been revised.

Question 26: Sheet C-0-107 please confirm that WVAMWCO will install the water line Note 36 into the vault including the valve or up to the valve. If up to the valve and the valve is part of our work, then is the gate valve 8" as shown on Sheet C-0-508?

Answer 26: Confirmed. Yes. The gate valve is 8".

Question 27: Sheet C-0-508 is the sump pump shown intended for the Fire Vault?

Answer 27: Correct.

Question 28: Sheet C-0-107 near the temporary electric service for the new maintenance building it looks like a sanitary line is extending into the building. This is not noted.

Answer 28: Correct. It's 4" PVC. See Note 42 on Sheet C-0-107 and Sheet C-0-106 for more information.

Question 29: Sign lettering are shown on Elevations. Where is the detail for type and size of Plaque, Lettering and panel signs? Detail 8/A-1-500 are the Owner provided and Owner installed signs.

Answer 29: For dimensional letter signage, provide Gemeni, cast aluminum, color anodized, Arial Bold font, 10" and 12" letters for mounting on metal building siding. No interior plaque is required.

Question 30: In room 110, Janitor, there is a line without any detail or tag. What is this?

Answer 30: Provide 14" deep, heavy duty coated wire shelving, wall mounted at 32" o.c. into studs, with shelves at 24", 42", 60", and 72" from wall to wall.

Question 31: Will the AWI certification for Plastic Laminate-Faced Casework and Plastic-Laminate Tops be enforced?

Answer 31: Provide AWI conformance as specified.

Question 32: This is taken from the Geotech report. "1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movement between the slab and foundation. Narrower, turned-down slab-on-grade foundations may be utilized at the approval of the structural engineer. The slabs should be appropriately reinforced to support the proposed loads." There are locations in most building details that tie the floor slabs to the foundation walls with dowels such as dowel bars and hairpins. Are these to be considered included as shown?

Answer 32: **Yes.**

Question 33: The Special Inspections Section 014533 indicate that the "**Contractor shall engage a third-party Special Inspector and qualified testing and inspecting agency to perform field tests and inspections**". To remain transparent to the IBC Chapter 1703.1.1 use the term independent from the contractor responsible for the work being inspected. Chapter 1704.1 indicate the owner or registered design professional shall employ this special inspector. We understand that the State is not obligated to follow the local building inspector, but should be obligated to follow the IBC as adopted. Please advise as we may choose to employ an independent inspector for our protection from liability.

Answer 33: The Vendor shall employ an independent Special Inspector approved by the Architect and Owner.

Question 34: After reviewing the Soils Report, we can see a conflict between the design of the Auger Cast and the As-Build record and the reduction or increase of total length will be a change order. The variant from depth of auger cast specified and the possible depth is in the range of 549' to 572'. This variance in elevations is not unusual. To make this more transparent, a unit price for total adds and deducts of 16" and 18" lengths would provide clarity. Please provide these units requested in the bid form.

Answer 34: Commodity Line 5 has been added to the wvOasis solicitation document (CRFQ), the Pricing Page has been revised to include it, and a "Unit Prices" section has been added to Division 1 of the Project Manual to provide information on reconciling the Unit Price. (Will need to add a Unit Prices Section to Division 1 - We will modify the Pricing Page to incorporate Commodity Line 5 to cover bidding a single Unit. We need to make sure our depths are clearly quantified in the bid documents).

Question 35: The Alternate Section 012300 Alternates list three Alternates. While simple alternates can be described in written word, these a complex alternates (sic). For example, we read that Phase 3 Alternate 3 on the drawings indicates Storm Retention Areas are included in this Alternate while the drawings indicate that Retention Areas 2, 3, and 4 are in 3 different areas on the drawings and should be included in the Base Bid, Alternate 2 and Alternate 3. There is no line defining Alternate 2 and Alternate 3 on respective Site paving and concrete, Site Grading and Drainage, or Site Utility. Light Poles are similarly in multiple Alternate packages. Utilities represent another large issue to analyze. While it is our job once we are selected to coordinate, it is the Engineers job to clearly delineate the drawings so that every bidder can price the work in a similar manner. We still have not found the Generator Yard in Alternate 2.

Answer 35: The Base Bid includes: Storm Lines 1 & 2, Detention System Nos. 1 & 2; Alternate 2 includes Storm Lines 3 & 4, Detention System No. 3; Alternate 3 includes Storm Lines 5 & 6, Detention System 4. Unless otherwise indicated, utilities serving the various structures will be constructed in the phase indicated for each structure. Keynotes on "Sheet C-0-107, SITE UTILITY PLAN" clearly indicate site lighting phasing. Unless otherwise indicated, site features and utilities will be constructed in the Base Bid. See "Sheet G-003, ALTERNATES AND PHASING PLAN" for delineation of site paving and concrete.

Question 36: The "Area Currently Under Construction that has the Green Metal Building relocated on something like a Type 1 concrete slab at 6" is not clear. From the drawings, we can see that we relocate the building. The foundation is undefined. There are paving areas and charging stations. Are these scope our or to be performed by others? The area is undefined related to paving, utilities, sidewalks except for the parking shown and electrical.

Answer 36: The requirements for the original location indicated for the Green Metal Building relocation (now for the construction of a new building) are indicated in the attached revised Project Plans. The destination for the relocation of the Green Metal Building is revised.

Question 37: Sheets A-1-700 and A-1-701 are incomplete. The Schedules for OFOI and CFCI are not complete. Lifts that indicate the contractor is to furnish do not have specifications. Other items are simply blank. For equipment T1, W1 and W2 we are assuming that this is for electrical information only and not to provide this equipment as part of our bid.

Answer 37: **Answer to be provided in Addendum 6, with revised and complete Equipment Schedules (including specification references for all equipment that will be Contractor Provided/Contractor Installed). However, the assumption that T1, W1, and W2 are Owner Provided/Owner Installed, and that they are referenced on the Schedule solely to indicate electrical information, is correct.**

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Question 38: One of the documents required is a building permit. Are we to submit drawing for a Building Permit from the City of Charleston?

Answer 38: Yes.

Question 39: Who is responsible for engineering PEMB anchor bolts. Chapman indicates a length of anchor bolt for column to foundation connection at 40" long. Chapman does not provide a diameter.

Answer 39: **Anchor bolt diameter is provided by the PEMB manufacturer and final embedment depth will be determined at the time of PEMB shop drawing review. The 40" embedment is for Contractor estimating purposes only. Final length and any necessary modifications to the anchor bolts/foundations will be provided after shop drawing review.**

Question 40: Does the PEMB provide anchor bolts? In the PEMB section it calls for anchor rods to connect to the foundation. Are these the Anchor Bolts?

Answer 40: **Contractor provides anchor bolts.**

Question 41: The liner panel is not specified in Section 133419 Metal Building Systems. Should this be added to the list of products?

Answer 41: Roof liner panels are tapered rib with exposed fasteners. Formed with raised trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Material is zinc-coated or aluminum-zinc alloy-coated steel sheet, 0.036-inch nominal uncoated steel thickness. Pre-painted by the coil-coating process to comply with ASTM A755/A755M. Exposed Finish is fluoropolymer, color as selected by Architect. Major rib spacing 12". Panel coverage 36". Panel height 1.25".

Wall liner panels are flush profile with exposed fasteners. Solid panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with flush joint between panels; designed to be installed for interior side of metal wall panel assemblies and installed by lapping interconnecting side edges of adjacent panels and mechanically attaching panels to supports using concealed fasteners in side laps. Material is zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.036-inch nominal uncoated steel thickness. Pre-painted by the coil-coating process to comply with ASTM A755/A755M. Exposed Finish is fluoropolymer, color as selected by Architect. Panel coverage 12". Panel height is 1.5".

Question 42: Air barrier is not list in the PEMB specification section nor is air barrier list in Division 07. Where is this product specified? Is this required on just the walls or walls and deck?

Answer 42: The vapor barrier of the PEMB insulation is the air barrier for the building.

Question 43: The list of products provided by the PEMB supplier are the window units. Is this correct?

Answer 43: The windows must be coordinated with the metal building system. If a metal building manufacturer does not provide the specified windows, they may be provided by another source subject to meeting the requirements of the specification. Testing data of the window meeting U-value requirements will is required in any case.

Question 44: Would the Hollow Metal doors and frames be a part of the PEMB section?

Answer 44: No.

Question 45: How much time would we allocate the duration to move in the maintenance shop once the substantial completion statement is provided? Will the Fire Marshal allow the partial occupancy without the Fire Sprinkler or Fire Alarm work completed? Note that the sprinkler and possibly the FA can't be built at the time of partial occupancy.

Answer 45: The specification revisions included in this Addendum make this question moot.

Question 46: Cast-in-concrete steel corner guards are required on piers as shown on 1/A-2-200. They are not required on all 4 corners. Is this correct?

Answer 46: Correct.

Question 47: Detail 3/A-520 does not specify a window sill material.

Answer 47: Provide 1/2" solid surface window sills with 1/2" overhang, Corian or equal, color selected by Architect from full range.

Question 48: What is the extent of the SELF-ADHERING SHEET WATERPROOFING?

Answer 48: Provide self-adhering sheet waterproofing from the top of footing/bottom of grade beam to 4" below finished grade.

Question 49: A-520 Detail 3 – Is the interior windowsill solid surface? What Material for 8 1/4" width sill?

Answer 49: Provide 1/2" solid surface window sills with 1/2" overhang, Corian or equal, color selected by Architect from full range.

Question 50: Is Detention System No. 1 & No. 2 included in the Base Bid?

Answer 50: Yes.

CRFQ GSD2200000014, Addendum #5
East Campus Metal Buildings Project
Technical Questions and Answers Submitted through November 5, 2021

Question 51: Is Detention System No. 3 in Alternate No. 1 or Alternate No. 2?

Answer 51: Alternate No. 2.

Question 52: Is Detention System No. 4 part of Alternate No. 3?

Answer 52: Yes.

Question 53:I am bidding as a sub-contractor on the doors for the East Campus Metal Building Capitol Complex and am asking to have C.H.I. Overhead doors considered as an approved alternate. Attached is their product flyer and specs for their doors. If there is anything you need from me feel free to contact me at the below numbers or email.

Answer 53: C.H.I. Overhead Doors is acceptable as an alternative manufacturer for overhead doors subject to meeting the specified requirements

Question 54: I have a question concerning the Star 4 truck restraint and the Mechanical EOD. The Star 4 is calling for an interlock: leveler does not operate while truck restraint is not engaged. This cannot be done with the Mechanical EOD, we could quote the aFX EOD which is electrical air operated and can be interlocked with the Star 4.

Answer 54: No interlock will be required for the mechanical dock leveler. Provide one set of wheel chocks with chains, mounting plates, and signs installed at each of the Receiving overhead doors.

Question 55: Auger Cast Pile Detail on S-1-501 WG calls for 6 dowels extended into top mat of footing. Note 4 states provide (8). Which is correct?

Answer 55: **Provide 6.**

Question 56. Is the vertical bar a #8 for the 18" diameter pile as well. The note indicates 16" and 18" are similar except the schedule calls for #7 bar in lieu of #6 bar. Please advise?
Answer 56: **Yes.**

Question 57: Same Detail as above, Section A-A does not show the center bar. Also, the Auger Cast equipment do not handle a center bar with a hook. This will need to be spliced. Please advise if this is ok.
Answer 57: **Splice of the bar with the top section being hooked is acceptable.**

Question 58: We are simply pointing out that you have build (sic) in a redundancy in the perimeter foundations under the Footer F1 and F2. This causes the foundation work to be 2'0" deeper to accommodate the pile cap. Is it not possible to eliminate the 3'x3' Pile Cap where you have an F1 or F2 foundation? This would save the excavation cost and drilling through so much overburden while only costing 2' length to auger cast piles. Please advise?

Answer 58: **Provide pile cap construction as indicated on the drawings.**

WVGSD
East Campus Metal Building Project
GSD2200000014

ADDENDUM NO. 5 SUMMARY
11/16/2021

A. Clarifications

1. The awarded Contractor will be provided revised sets of Construction Drawings and Project Manual incorporating revisions made by addendum.

B. Technical Questions and Answers

1. All Technical Questions submitted through November 5, 2021 are answered herein. See partial bidder questions and answers, attached (questions 1-57). Questions submitted after that date, and through the revised Deadline of November 29, 2021, will be answered in a subsequent Addendum.

C. Modifications

1. CRFQ Modifications:

a. **General Construction Specifications:** In the General Construction Specifications section of the CRFQ, in Item 10. SUBSTANTIAL AND FINAL COMPLETION, revise to read:

"Vendor shall achieve substantial completion, by Phase, as indicated below, with the stated number of calendar days after the Contract start date established by the issuance of the Notice to Proceed. See Drawing G-003, Alternates and Phasing Plan. Failure to meet the deadlines established herein, unless extended by change order authorizing additional time free of liquidated damages, will result in liquidated damages being applied:

Phase A: Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase B: Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase C1: If awarded as Alternate #1, Substantially Complete within **Five Hundred and Forty (540)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase C2: Phase C2 may not begin until Phase C1 has been Substantially Completed and the personnel and equipment of the WV Office of Technology is moved into the new Mailroom, but otherwise must be Substantially Complete within **Seven Hundred and Fifty (750)** calendar

days after the start date established by the issuance of the Notice to Proceed.

Phase D: If awarded as Alternate #2, Phase D may not begin until Phase C2 has at least begun, but otherwise must be Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase E: If awarded as Alternate #3, Phase E must be Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Final Completion: For each of the aforementioned Phases, Final Completion is to be achieved no later than Thirty (30) calendar days after Substantial Completion."

b. Pricing Page: See attached, revised Pricing Page, revised to capture the Unit Price added as part of this Addendum.

2. **Project Manual Modifications**:

a. Spec Section 011000.1.5.A – Revise to read: "The Work shall be conducted in sequenced phases, as noted on the plans. The Owner will consider alternate Contractor phasing plans which minimize disruption of public parking and Owner operations and maximize efficient progress of the Work during the entire Fixed Period Contract Term. Note: No sitework can be performed west of Jefferson Street prior to the end of the 2022 Legislative Session. Phase A (construction of a metal building which will temporarily house the GSD Grounds Mechanics Shop and some adjacent space) must be Substantially Complete and Owner occupied prior to the existing block building housing the current Grounds Mechanics Shop being demolished (as part of Phase B); contractor should allow for approximately two weeks for the Grounds Mechanic to move from the existing block building into the temporary building. The construction of the Phase C1 New Mailroom must be Substantially Complete and Owner occupied prior to the demolition of the existing Mailroom in Phase C2; Owner will move into the New Mailroom no later than upon Final Completion of Phase C1 (i.e. 30 days after the Contractor having achieved Substantial Completion). Scheduling of the Phases shall allow time between sub-phases for Owner to move from existing facilities into newly constructed ones. All phases of construction shall be coordinated to not interfere with Owner's occupation and use of the existing and the new facilities, including the Mechanics Shop, the Mailroom, plus access (Owner, not public) to the lot being constructed (under separate contract) to the east of the Chiller Plant expansion and immediately west of the current Jefferson Street."

b. Spec Section 012200, Unit Prices: In Division 1 of the Project Manual, add Spec Section 012200, to cover the inclusion of an add/deduct Unit Prices for sizing of Auger Cast Pilings.

c. Spec Section 028200 Asbestos Abatement Specification – Use revised ACM Table and sample location map, attached.

d. Spec Section 087100 – Use revised Hardware Sets, attached.

1) The following doors are to be provided with card readers, appropriate electrical and communications connections, and hardware types as noted:

Warehouse		
	ii. Door 100D	HS 17
	iii. Door 107B	HS 04
Mail Room		
	iv. Door 101A-MR	HS 03
	v. Door 105A-MR	HS 04
	vi. Door 110A-MR	HS 03

3. Drawing Modifications:

a. Drawing G-003, replace with revised drawing, attached:

1) Revised phasing to move Grounds Mechanic out of work area prior to construction of Warehouse/Grounds Building.

b. Drawing C-0-101, replace with revised drawing, attached:

1) Revise Demo Note 5 to - "Remove two of the three remaining metal pole buildings. The third structure will be removed and relocated by the *Contractor to a location on campus as directed by the Owner.* Contractor shall take ownership of the remaining two structures upon contract award. Any salvage value is to be credited to the Owner as part of the Base Bid.

2) Add Demo Note 6 – "Relocate Green Metal Shelter to east end of lot."

c. Drawing C-0-102, replace with revised drawing, attached:

1) Provide Temporary Shop Building.
2) Relocate Green Metal Shelter to east end of lot.

d. Drawing C-0-103, replace with revised drawing, attached.

1) Provide Temporary Shop Building.

e. Drawing C-0-104, replace with revised drawing, attached.

1) Relocate Green Metal Shelter to east end of lot.

f. Drawing C-0-105, replace with revised drawing, attached.

1) Provide Temporary Shop Building.

g. Drawing C-0-106, replace with revised drawing, attached.

1) Relocate Green Metal Shelter to east end of lot.

h. Drawing C-0-107, replace with revised drawing, attached.

1) Provide Temporary Shop Building.
2) Relocate Green Metal Shelter to east end of lot.
3) Remove Phase 1 Temporary Electrical Service and Sheet Notes 7-10.
4) Adjust location of vehicle block heater receptacle pedestals.
5) Adjust location of Panel L5 and feeder from transformer.
6) Add connections for temporary fuel station location.
7) Add Sheet Notes 62-63.
8) Updated Sheet Note 58.
9) Alternates notation revised.

i. Drawing C-0-506, replace with revised drawing, attached; Add meter assembly detail

j. Drawing A-1-701, delete detail 2/A-1-701 Phase 1 Equipment Plan Area 'C'.

k. Add Drawing A-4-100, See new drawing for Temporary Shop Building plans and concrete work, attached.

l. All Plumbing Drawings – All references to Phase 1 installation shall be removed from this project. All work shall be installed in final building configuration.

m. Add Drawing P-4-100, Add Temporary Shop Building plumbing work, attached.

n. Add Drawing M-4-100, Add Temporary Shop Building mechanical work, attached.

o. All Mechanical Drawings – All references to Phase 1 installation shall be removed from this project. All work shall be installed in final building configuration.

p. Drawing M-701, Revise the following temperature setpoints.

a. For RTU-01, set SPACE TEMPERATURE SETPOINT-COOLING TO 80F (adj) AND SPACE TEMPERATURE SETPOINT-HEATING TO 60F (adj).
b. For RTU-02 and RTU-03, set SPACE TEMPERATURE SETPOINT-COOLING TO 70F (adj), HEATING TO REMAIN AT 68F (adj)

q. Drawing M-702, Revise the following temperature setpoints.

a. For AHU-01 and AHU-02, set SPACE TEMPERATURE SETPOINT-COOLING TO 70F (adj), HEATING TO REMAIN AT 68F (adj)

r. Drawing E-1-102 –

a. Change LF-2D to LF-2B in Room 126.
b. Change LF-2DE to LF-2BE in Room 126.
c. Change circuit feeding lights in Room 126.

s. Drawing E-1-103, Provide power to doorbell chimes as shown.

a. Provide power to doorbell chimes as shown.

t. Drawing E-1-104

a. Provide power to doorbell chimes as shown.
b. Remove reference to Phase 1 and Enlarged Plan 1/E-1-401.
c. Add reference to enlarged plan 6/E-1-400 and Sheet Notes 29 & 30.
d. Add enlarged plan 6 "Enlarged Plumbing Connection Plan"
e. Remove references to Phase 1.
f. Remove enlarged plan 1 "Enlarged Gnd Mech Shop Power Plan - Phase 1A".

u. Drawing E-1-105, Add card reader to door 100D (Exterior Side).

v. Drawing E-1-106, Add card reader to door 107B (Corridor 112 Side).

w. Drawing E-1-400, Add plan 6/E-1-400 "Enlarged Plumbing Connection Plan

x. Drawing E-1-401, Remove references to Phase 1 and remove plan 1/E-1-401 Enlarged GND Mech Shop Power Plan – Phase 1A.

y. Drawing E-3-103, Add card reader to doors, 101 (Exterior Side), 110A (Exterior Side), and 105A (Exterior Side).

z. Drawing E-4-100 – Add New Sheet for Maintenance Building – Electrical Plans.

aa. Drawing E-600, Revise part numbers for LF-2B, LF-2BE, & LF-2C as follows:

a. LF-2B – Model Number: IBE-L24-15000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU
b. LF-2BE – Model Number: IBE-L24-15000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU-E15WCP-BPK
c. LF-2C – Model Number: IBE-L24-22000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LCH0SZU

bb. Drawing E-601

a. Provide 20A Single pole breaker in Panel space L2B-31.

b. Provide 2#12, 1#12G, 3/4"C from breaker to plumbing fixtures as shown on E-1-400.

cc. Drawing E-603, replace with revised drawing, attached.

a. Revise Panel L5.

End of Addendum 5

Exhibit A Pricing Page
(Addendum No. 5 Revised Pricing Page)

State of West Virginia – General Services Division – East Campus Project

Name of Bidder:

_____

The Bidder, being familiar with and understanding the Bidding Documents and also having examined the site and being familiar with all local conditions affecting the project hereby proposes to furnish all labor, material, equipment, supplies and transportation and to perform all Work in accordance with the Bidding Documents within the time set forth for the sum of:

Base Bid:

$_____(Commodity Line 1)(A)

_____

(Show amount in both words and numbers)

Alternate #1 Bid (All work associated with the construction of the new mailroom and demolition of the existing mailroom, Phase C, per Specifications Section 012300):

$_____(Commodity Line 2)(B)

_____

(Show amount in both words and numbers)

Alternate #2 Bid (All work associated with the utilities, paving and light poles for the generator yard, road and parking area, Phase D , per Specifications Section 012300):

$_____(Commodity Line 3)(C)

_____

(Show amount in both words and numbers)

Alternate #3 Bid (All work associated with the utilities, paving, light poles and storm retention area for the parking area, Phase E , per Specifications Section 012300):

$_____(Commodity Line 4)(D)

_____

(Show amount in both words and numbers)

Unit Price #1, 18 Inch Augered Cast Piles: Add/deduct all-inclusive price, per two linear feet, to cover variation in actual depths of 18" diameter Augered Cast Piles to what is indicated in the Project Plans (See Project Manual, Division 1, Section 012200):

$_____(Commodity Line 5), per two linear feet. (E)

_____

(Show amount in both words and numbers)

Unit Price #2, 16 Inch Augered Cast Piles: Add/deduct all-inclusive price, per two linear feet, to cover variation in actual depths of 16" diameter Augered Cast Piles to what is indicated in the Project Plans (See Project Manual, Division 1, Section 012200):

$_____(Commodity Line 6), per two linear feet. (F)

_____

(Show amount in both words and numbers)

TOTAL BID AMOUNT (A+B+C+D+E+F):

$_____

_____

(Show amount in both words and numbers)

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is a single amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased. One amount is to be provided for each unit price. Multiple prices or prices for deduct that differ from prices for adds will be considered non-responsive.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1 – 18 Inch Augered Cast Piles:

1. Description: Eighteen (18) inch diameter augered piles. For Bidding purposes the assumed depth for each augered cast pile is 49.33 lineal feet, of augered piles as detailed in the drawings in place. Provide a single unit price for two (2) lineal feet to be added to or deleted from the base quantity and tolerance.
2. Unit of Measurement: Per two (2) lineal feet of eighteen (18) inch diameter reinforced augered pile.

B. Unit Price No. 2 – 16 Inch Augered Cast Piles:

1. Description: Sixteen (16) inch diameter augered piles. For Bidding purposes the assumed depth for each augered cast pile is 49.33 lineal feet, of augered piles as detailed in the drawings in place. Provide a single unit price for two (2) lineal feet to be added to or deleted from the base quantity and tolerance.
2. Unit of Measurement: Per two (2) lineal feet of sixteen (16) inch diameter reinforced augered pile.

END OF SECTION 012200

SECTION 028200

ASBESTOS ABATEMENT SPECIFICATION

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

Drawings, general provisions of the contract, including general and supplementary conditions and other specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial Owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Owner for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Owner shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred due to such action are also the responsibility of the Asbestos Abatement Contractor.

1.1.2 EXTENT OF WORK

A. Below is a brief description of the estimated quantities of asbestos materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.

B. Removal, clean-up and disposal of the following asbestos-containing materials (ACM) in appropriately regulated areas:

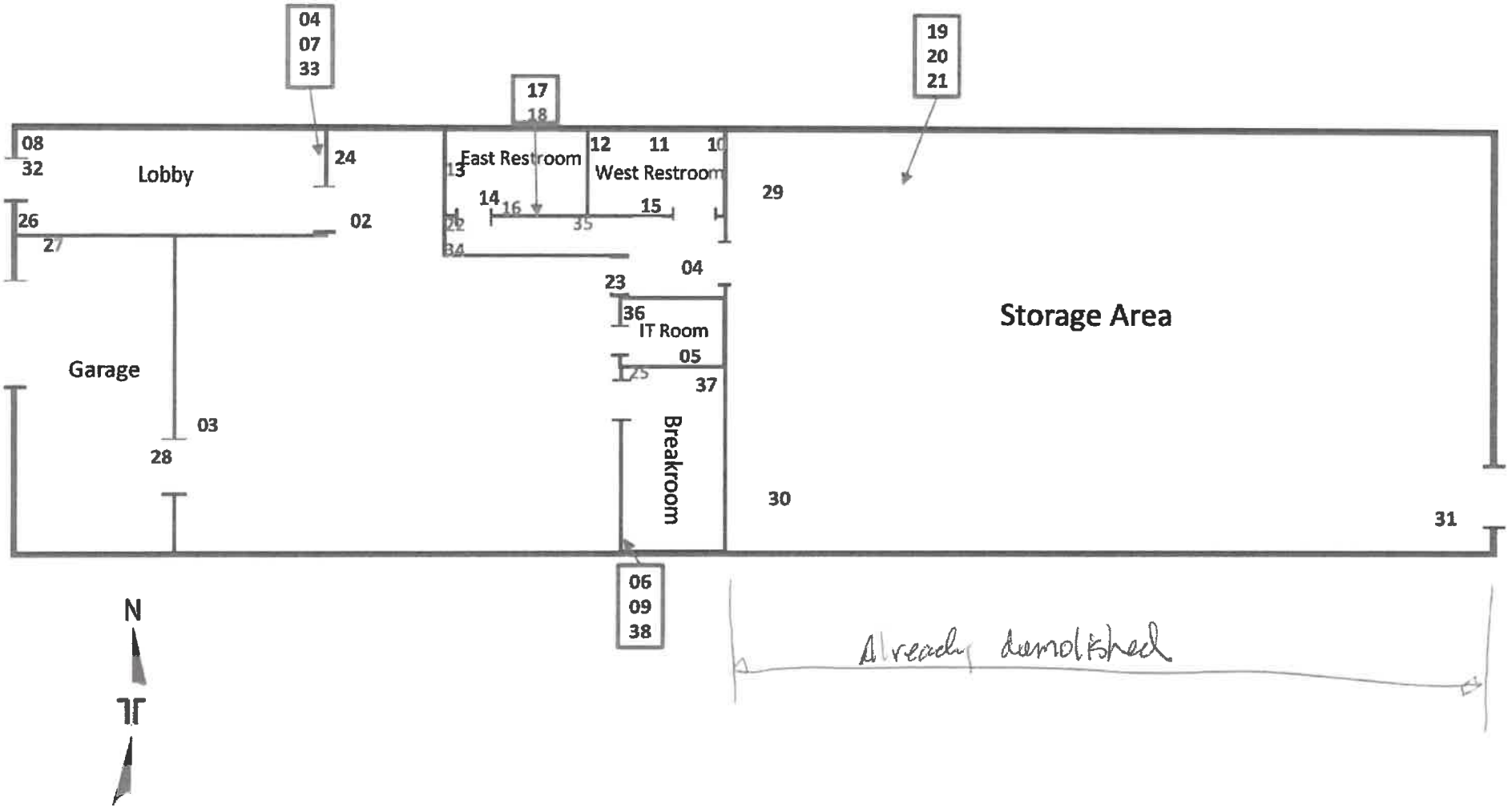
ACM Table

ACM Description	Material Location	% and Type Asbestos	Estimated Quantity*
Black Tar	Seams on Top of Parapet Walls on Roof of Building 33	5% Chrysotile	50 Square Feet (SF)
Roof Flashing	Roof of Building 33	7-9% Chrysotile	190 SF
Roof	Roof of Building 33	7-9% Chrysotile	2,800 SF
Exterior Window Caulking	Maintenance Garage Windows	<1% Chrysotile	10 SF or 5 Windows

*The Abatement Contractor is solely responsible for determining their opinion of quantities to be removed.

1.1.4 TASKS

The work tasks are summarized briefly as follows:



Project No. N2207016	Date: May 28, 2020	**Building 33 Interior**	**Exhibit**
Project Manager: Joshua Vogel		WV State Capitol Complex 321 Michigan Avenue Charleston, WV 25305	1
Location: Charleston, WV		Sample Location Map	
APR: Joe Tussey			

Terracon
Consulting Engineers and Scientists
611 Lunken Park Drive Cincinnati, Ohio 45226
PH. (513) 321-05816 FAX (513) 321-0294

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.7 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.8 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.9 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

Revised Hardware Sets

HARDWARE SETS:

VERIFY LOCKSET FUNCTION WITH ARCHITECT AND OWNER BEFORE PROVIDING SUBMITTALS.

HARDWARE GROUP NO. 01

FOR USE ON DOOR #(S):

100B	100C	101B	102A	107D	110C-MR
123B	123E	125B	126B	123F	

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA		All Hardware by Door Supplier		

HARDWARE GROUP NO. 02

FOR USE ON DOOR #(S):
105B-MR 110B-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1			NO HARDWARE REQUIRED (CASED OPENING)		

HARDWARE GROUP NO. 03

FOR USE ON DOOR #(S):
101-MR 110A-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	INTERFACE BOX	JB7 AS REQUIRED		VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI	689	LCN
1	EA	MOUNTING PLATE	MOUNTING PLATES/BRACKETS AS REQUIRED	689	LCN
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	DOOR CONTACT	679-05WD/HM AS REQUIRED	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS Coordinate Power Supply Requirement with Security Provider	LGR	VON
1			PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		
1			SEALS BY DOOR SUPPLIER		

OPERATIONAL: DOOR CLOSED AND LOCKED. VALID CREDENTIAL ALLOWS ACCESS. FREE EGRESS AT ALL TIMES. DPS TO BE USED BY ACCESS CONTROL.

HARDWARE GROUP NO. 04

FOR USE ON DOOR #(S):

100D	103A	105A-MR	106A	118A
123A	125A			

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 4.5x5.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	INTERFACE BOX	JB7 AS REQUIRED		VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	MOUNTING PLATE	MOUNTING PLATES/BRACKETS AS REQUIRED	689	LCN
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	DOOR CONTACT	679-05WD/HM AS REQUIRED	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS Coordinate Power Supply Requirement with Security Provider	LGR	VON
1			PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		

OPERATIONAL: DOOR CLOSED AND LOCKED. VALID CREDENTIAL ALLOWS ACCESS. FREE EGRESS AT ALL TIMES. DPS TO BE USED BY ACCESS CONTROL.

HARDWARE GROUP NO. 05

FOR USE ON DOOR #(S):
106-MR 107-MR 113A 116A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 17A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCERS	SR64	GRY	IVE

HARDWARE GROUP NO. 06

FOR USE ON DOOR #(S):
103-MR 104-MR 104A 104B 107C 126C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	PERIMETER SEAL	488S	CLR	ZER

HARDWARE GROUP NO. 07

FOR USE ON DOOR #(S):
105A 120A 121A 122A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCERS	SR64	GRY	IVE
1	EA	COAT AND HAT HOOK (WALL MOUNT)	574	626	IVE

HARDWARE GROUP NO. 08

FOR USE ON DOOR #(S):
109-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCERS	SR64	GRY	IVE
2	EA	COAT AND HAT HOOK (WALL MOUNT)	574	626	IVE

HARDWARE GROUP NO. 09

FOR USE ON DOOR #(S):
108-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17A	626	SCH
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCERS	SR64	GRY	IVE

HARDWARE GROUP NO. 10

FOR USE ON DOOR #(S):

100A	101A	102B	103B	106B
107A	107E	123D	125C	126A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 4.5X5.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD-99-NL-OP-110MD	626	VON
1	EA	MORTISE CYLINDER	20-059 X K510-730 XQ11-948	626	SCH
2	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE GROUP NO. 11

FOR USE ON DOOR #(S):
102A-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	SPRING HINGE	3SP1 4.5 X 4.5 BTM LEAF	652	IVE
2	EA	HINGE	5BB1 4.5 X 4.5 TOP LEAF	652	IVE
1	EA	DUTCH DOOR BOLT	054 TOP LEAF	626	IVE
1	EA	STOREROOM LOCK	L9080T 17A BTM LEAF	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP BTM LEAF	626	SCH
1	EA	WALL STOP/HOLDER	FS495 TOP LEAF	626	IVE
1	EA	WALL STOP	WS406/407CCV BTM LEAF	630	IVE
4	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12

FOR USE ON DOOR #(S):
110A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER

HARDWARE GROUP NO. 13

FOR USE ON DOOR #(S):
114A 115A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 14

FOR USE ON DOOR #(S):
118B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 15

FOR USE ON DOOR #(S):
109A 117A 124A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BBHW 4.5X5.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE GROUP NO. 16

FOR USE ON DOOR #(S):
112A 123C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	PERIMETER SEAL	488S	CLR	ZER

HARDWARE GROUP NO. 17

FOR USE ON DOOR #(S):
101D 107B 119A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BBHW 4.5X5.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	INTERFACE BOX	JB7 AS REQUIRED		VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	MOUNTING PLATE	MOUNTING PLATES/BRACKETS AS REQUIRED	689	LCN
1	EA	DOOR CONTACT	679-05WD/HM AS REQUIRED	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS Coordinate Power Supply Requirement with Security Provider	LGR	VON
1			PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		

OPERATIONAL: DOOR CLOSED AND LOCKED. VALID CREDENTIAL OR REMOTE SWITCH ALLOWS ACCESS. FREE EGRESS AT ALL TIMES. DPS TO BE USED BY ACCESS CONTROL.

HARDWARE GROUP NO. 18

FOR USE ON DOOR #(S):
126C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	WALL STOP	WS406/407CCV	WS406/407CCV	WS406/407CCV
1	EA	SURFACE CLOSER	4040XP EDA (180 deg)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	PERIMETER SEAL	488S	CLR	ZER

PROVIDE MAGNETIC HOLD OPEN FOR DOOR – NOT REQUIRED UNTIL FULL OCCUPATION

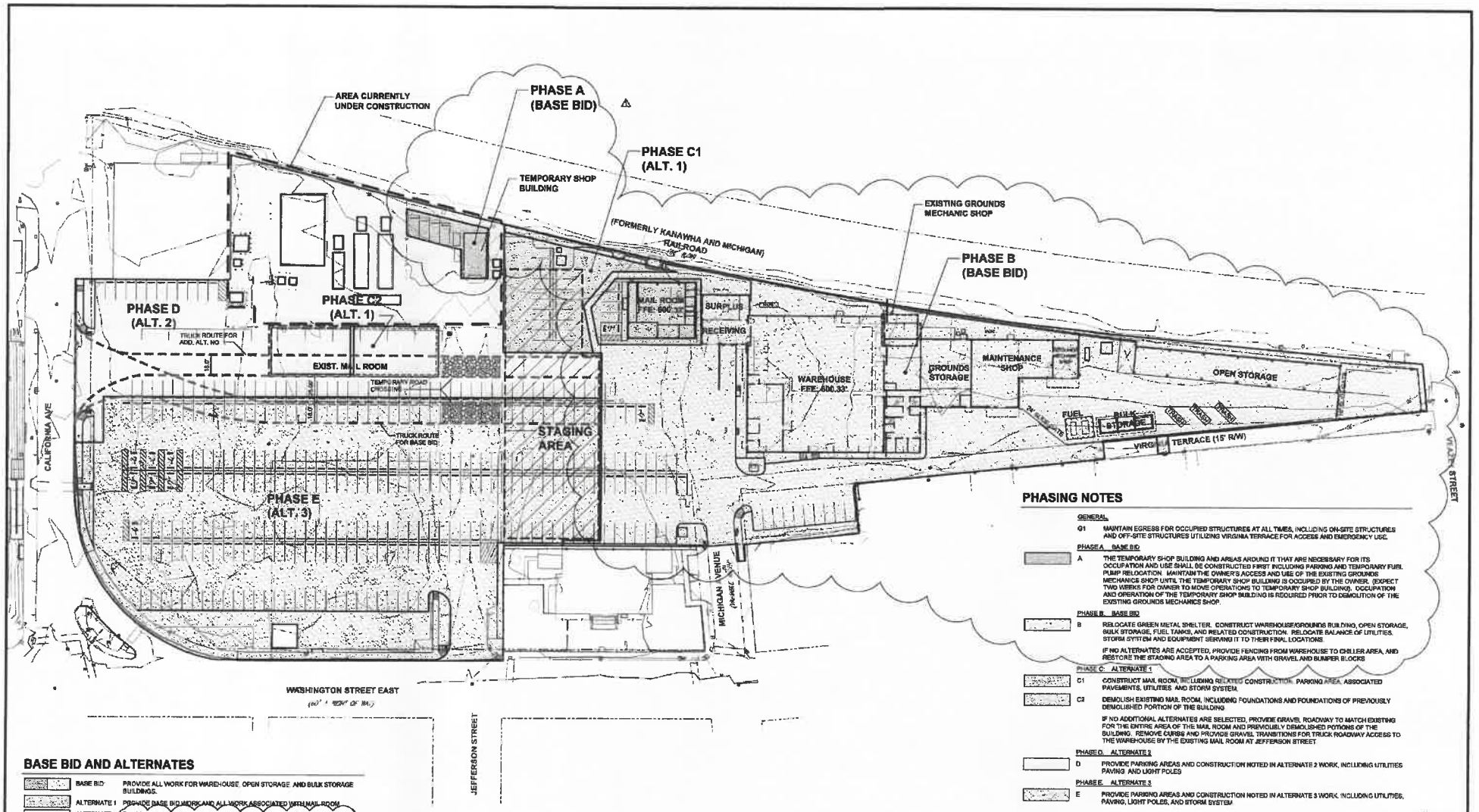
HARDWARE GROUP NO. 19

FOR USE ON DOOR #(S):
109B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BBHW 4.5X5.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER

End of Section



BASE BID AND ALTERNATES

- BASE BID: PROVIDE ALL WORK FOR WAREHOUSE, OPEN STORAGE, AND BULK STORAGE BUILDINGS.
- ALTERNATE 1: PROVIDE BASE BID WORK AND ALL WORK ASSOCIATED WITH MAIL ROOM.
- ALTERNATE 2: PROVIDE BASE BID, ALTERNATE 1, AND ALL WORK ASSOCIATED WITH ROAD, AND PARKING AREA NOTED
- ALTERNATE 3: PROVIDE BASE BID, ALTERNATE 1, ALTERNATE 2, AND ALL WORK ASSOCIATED WITH THE PARKING AREA NOTED.
- STAGING AREA

PHASING NOTES

GENERAL

G1 MAINTAIN EGRESS FOR OCCUPIED STRUCTURES AT ALL TIMES, INCLUDING ON-SITE STRUCTURES AND OFF-SITE STRUCTURES UTILIZING VIRGINIA TERRACE FOR ACCESS AND EMERGENCY USE.

PHASE A BASE BID

A THE TEMPORARY SHOP BUILDING AND AREAS AROUND IT THAT ARE NECESSARY FOR ITS OCCUPATION AND USE SHALL BE CONSTRUCTED FIRST INCLUDING PARKING AND TEMPORARY FUEL PUMP RELOCATION. MAINTAIN THE OWNER'S ACCESS AND USE OF THE EXISTING GROUNDS MECHANICS SHOP UNTIL THE TEMPORARY SHOP BUILDING IS OCCUPIED BY THE OWNER. (EXPECT TWO WEEKS FOR OWNER TO MOVE OPERATIONS TO TEMPORARY SHOP BUILDING). OCCUPATION AND OPERATION OF THE TEMPORARY SHOP BUILDING IS REQUIRED PRIOR TO DEMOLITION OF THE EXISTING GROUNDS MECHANICS SHOP.

PHASE B BASE BID

B RELOCATE GREEN METAL SHELTER. CONSTRUCT WAREHOUSE/GROUNDS BUILDING, OPEN STORAGE, BULK STORAGE, FUEL TANKS, AND RELATED CONSTRUCTION. RELOCATE BALANCE OF UTILITIES, STORM SYSTEM AND EQUIPMENT SERVING IT TO THEIR FINAL LOCATIONS.

IF NO ALTERNATES ARE ACCEPTED, PROVIDE FENCING FROM WAREHOUSE TO CHILLER AREA, AND RESTORE THE STAGING AREA TO A PARKING AREA WITH GRAVEL AND BUMPER BLOCKS

PHASE C ALTERNATE 1

C1 CONSTRUCT MAIL ROOM, INCLUDING RELATED CONSTRUCTION, PARKING AREA, ASSOCIATED PAVEMENTS, UTILITIES AND STORM SYSTEM.

C2 DEMOLISH EXISTING MAIL ROOM, INCLUDING FOUNDATIONS AND FOUNDATIONS OF PREVIOUSLY DEMOLISHED PORTION OF THE BUILDING

IF NO ADDITIONAL ALTERNATES ARE SELECTED, PROVIDE GRAVEL ROADWAY TO MATCH EXISTING FOR THE ENTIRE AREA OF THE MAIL ROOM AND PREVIOUSLY DEMOLISHED POTIONS OF THE BUILDING. REMOVE CURBS AND PROVIDE GRAVEL TRANSITIONS FOR TRUCK ROADWAY ACCESS TO THE WAREHOUSE BY THE EXISTING MAIL ROOM AT JEFFERSON STREET.

PHASE D ALTERNATE 2

D PROVIDE PARKING AREAS AND CONSTRUCTION NOTED IN ALTERNATE 2 WORK, INCLUDING UTILITIES PAVING AND LIGHT POLES

PHASE E ALTERNATE 3

E PROVIDE PARKING AREAS AND CONSTRUCTION NOTED IN ALTERNATE 3 WORK, INCLUDING UTILITIES, PAVING, LIGHT POLES, AND STORM SYSTEM

NORTH

REVISION NUMBER	REVISIONS	DATE	BY
1	PHASING REVISIONS	11/1/21	PAW

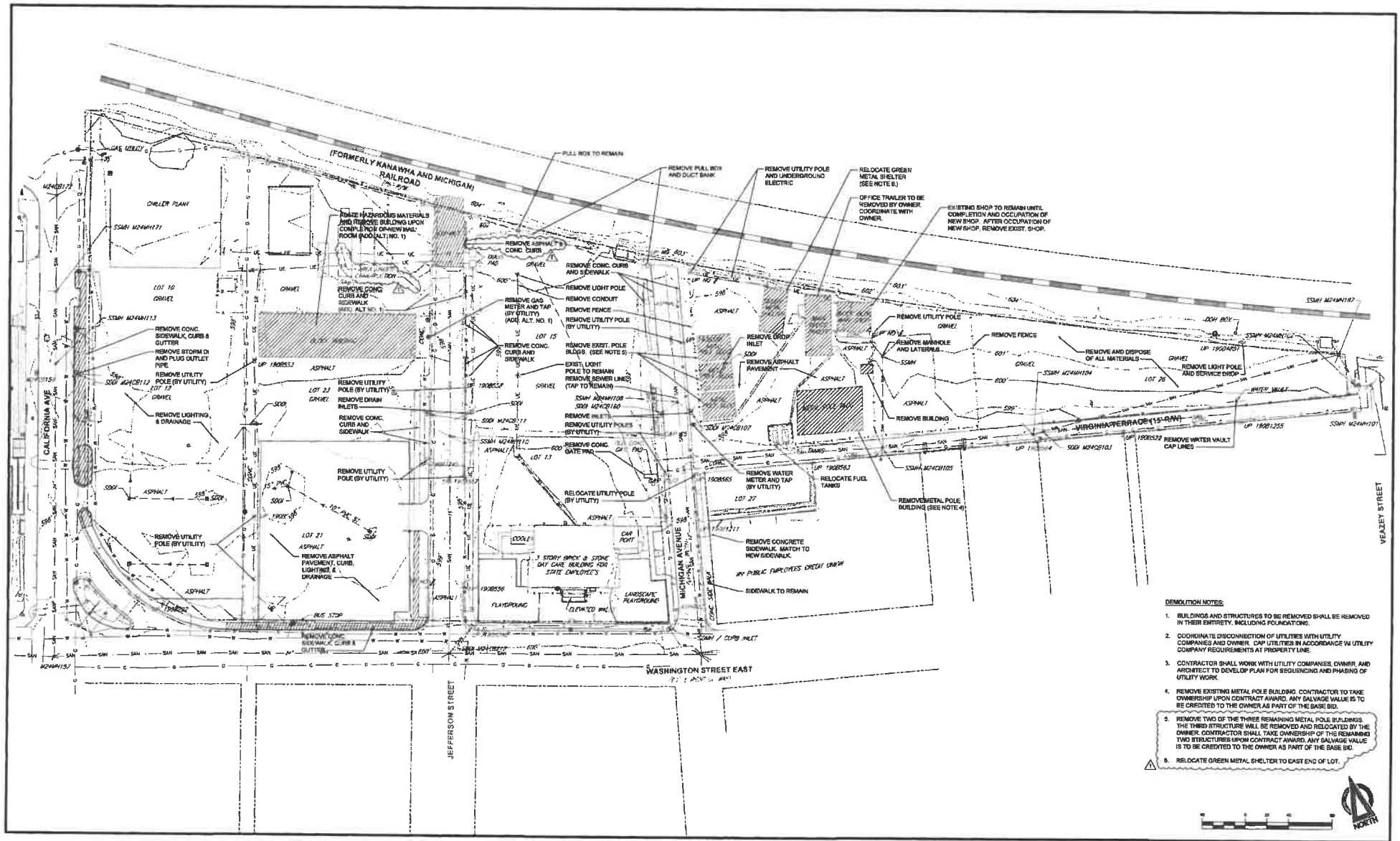
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ALTERNATES AND PHASING PLAN

PHILIP ALAN WARWICK, JR. 021501 REGISTERED ARCHITECT STATE OF WEST VIRGINIA 11/1/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 9, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	JEB
SHEET NO.	G-003
REVISION	1



DEMOLITION NOTES:

1. BUILDINGS AND STRUCTURES TO BE REMOVED SHALL BE REMOVED IN THEIR ENTIRETY, INCLUDING FOUNDATIONS.
2. COORDINATE DISCONNECTION OF UTILITIES WITH UTILITY COMPANIES AND OWNER. CAP UTILITIES IN ACCORDANCE W/ UTILITY COMPANY REQUIREMENTS AT PROPERTY LINE.
3. CONTRACTOR SHALL WORK WITH UTILITY COMPANIES, OWNER, AND ARCHITECT TO DEVELOP PLAN FOR SEQUENCING AND PHASING OF UTILITY WORK.
4. REMOVE EXISTING METAL POLE BUILDING. CONTRACTOR TO TAKE OWNERSHIP UPON CONTRACT AWARD. ANY SALVAGE VALUE IS TO BE CREDITED TO THE OWNER AS PART OF THE BASE BID.
5. REMOVE TWO OF THE THREE REMAINING METAL POLE BUILDINGS. THE THIRD STRUCTURE WILL BE REMOVED AND RELOCATED BY THE OWNER. CONTRACTOR SHALL TAKE OWNERSHIP OF THE REMAINING TWO STRUCTURES UPON CONTRACT AWARD. ANY SALVAGE VALUE IS TO BE CREDITED TO THE OWNER AS PART OF THE BASE BID.
6. RELOCATE GREEN METAL SHELTER TO EAST END OF LOT.

NORTH

REVISION NUMBER	REVISIONS	DATE	BY
1	NOTE REVISIONS	11/8/2021	RJK

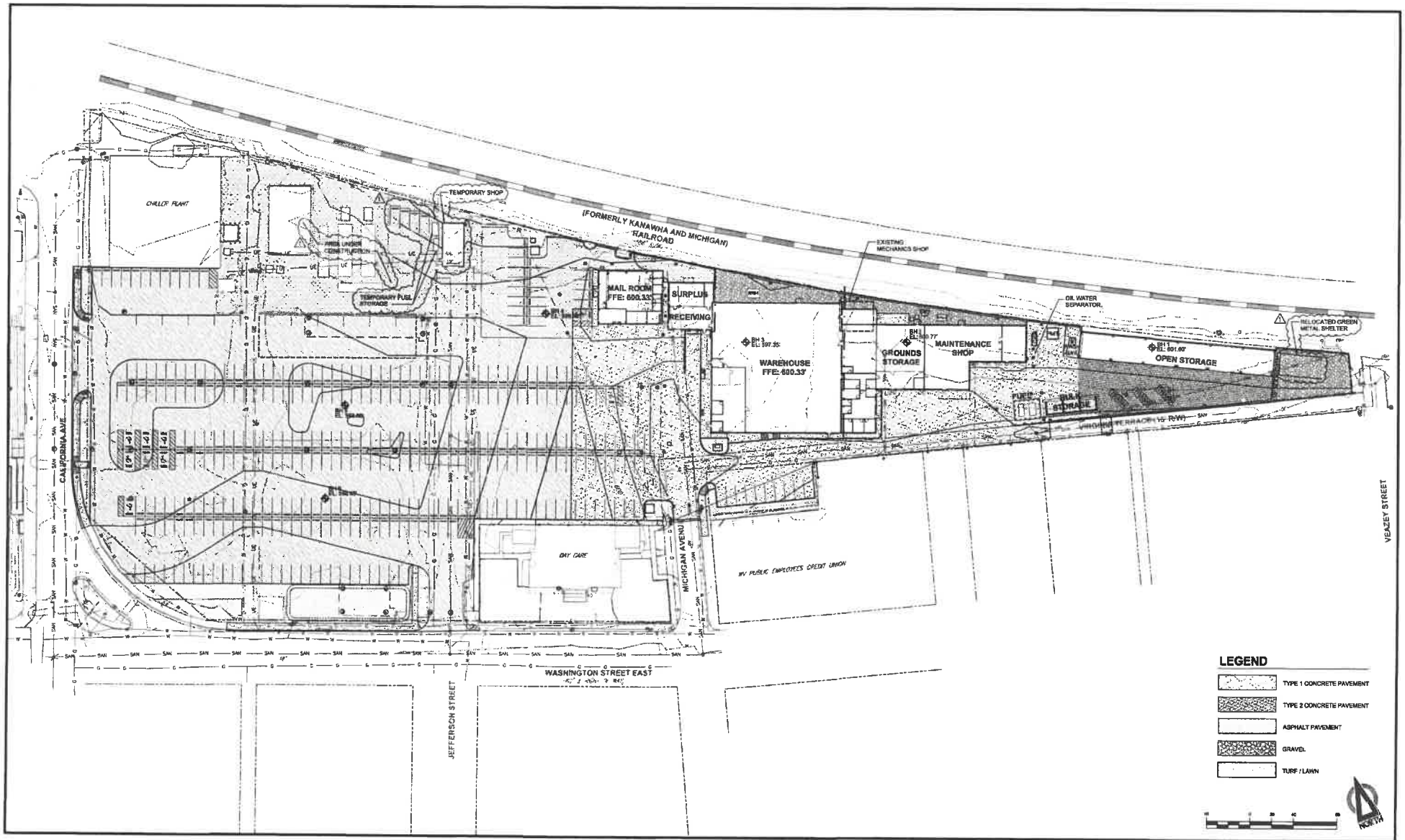
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PROJECT INFORMATION
West Virginia Department of Administration
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Charleston, West Virginia

SITE DEMOLITION PLAN

ROGER S. KENNEDY No. 287 REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT STATE OF WEST VIRGINIA
11-8-21

JOB NUMBER	19027
SCALE	1" = 40'
DATE	AUGUST 6, 2021
DRAWN BY	FLE
DESIGNED BY	RJK
CHECKED BY	JEB
SHEET NO.	C-0-101
REVISION	1



REVISION NUMBER	REVISIONS	DATE	BY
1	ADD TEMP. SHOP, RELOCATE GREEN SHELTER	11/5/2021	RJK

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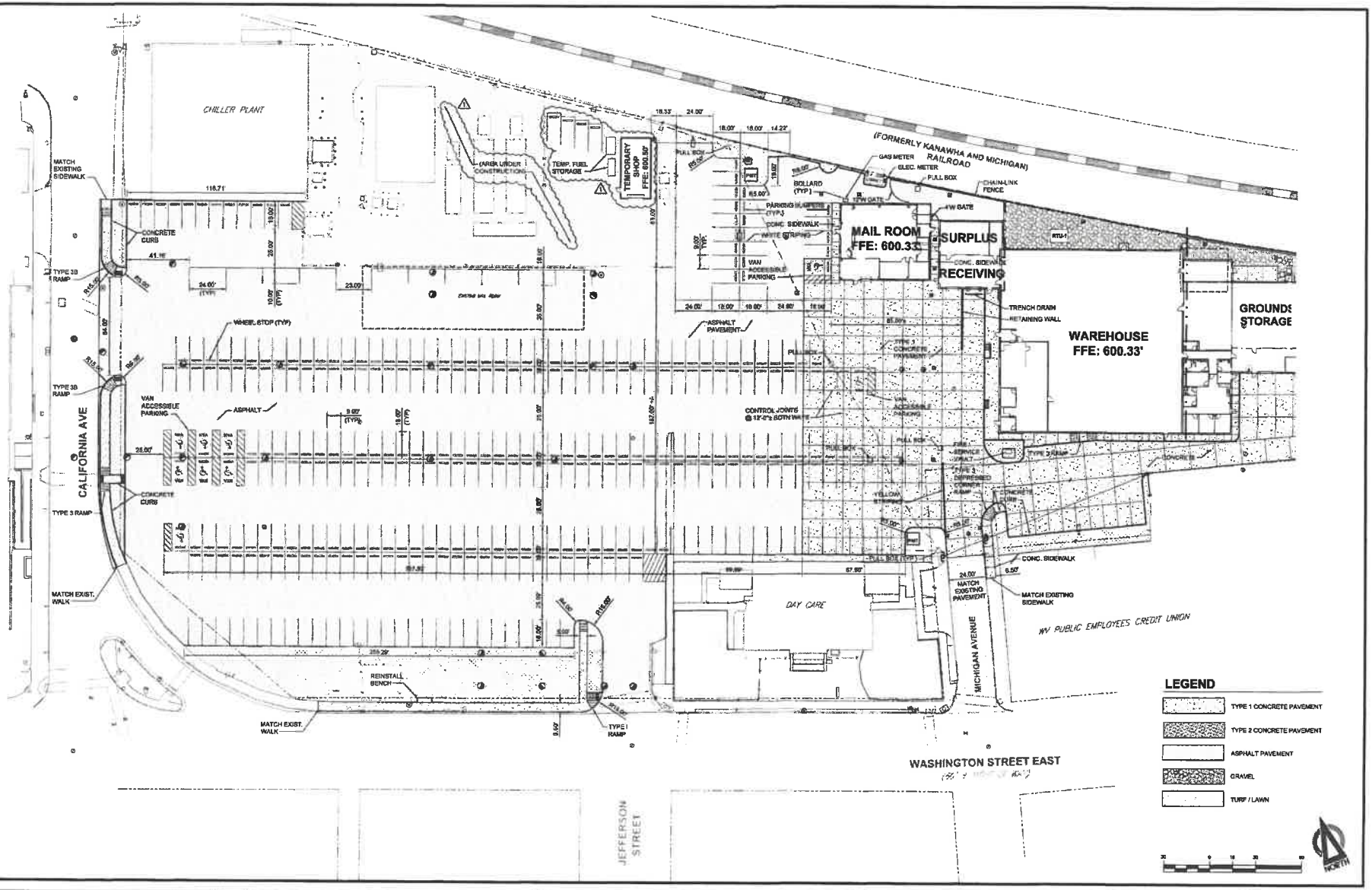
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

OVERALL PROPOSED SITE PLAN

PROFESSIONAL LANDSCAPE ARCHITECT ROGER A. RUMBERGER No. 339 STATE OF WEST VIRGINIA
11-5-21

JOB NUMBER:	19077
SCALE:	1" = 40'
DATE:	AUGUST 6, 2021
DRAWN BY:	FJB
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-102
REVISION	1



REVISION NUMBER	REVISIONS	DATE	BY
1	ADD TEMP. SHOP	11/8/2021	RJK

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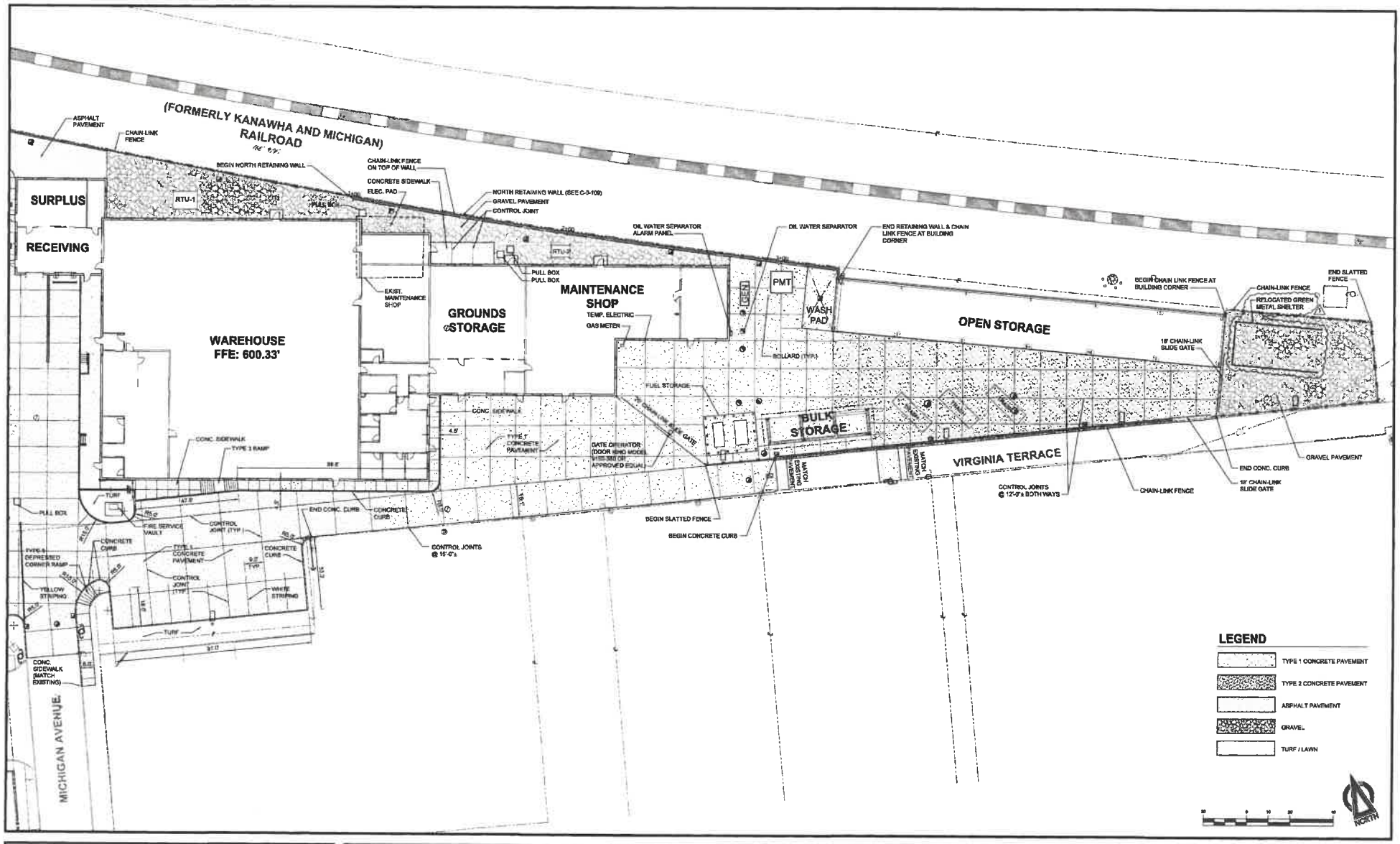
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West Virginia Department of Administration
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SITE LAYOUT AND MATERIALS PLAN - WEST

PROFESSIONAL LANDSCAPE ARCHITECT ROGER J. KENNEDY No. 237 STATE OF WEST VIRGINIA 11-8-21

JOB NUMBER:	19037
SCALE:	1" = 30'
DATE:	AUGUST 6, 2021
DRAWN BY:	CTG
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-103
REVISION	1



REVISION NUMBER	REVISIONS	DATE	BY
1	RELOCATE GREEN SHELTER	11/5/2021	RJK

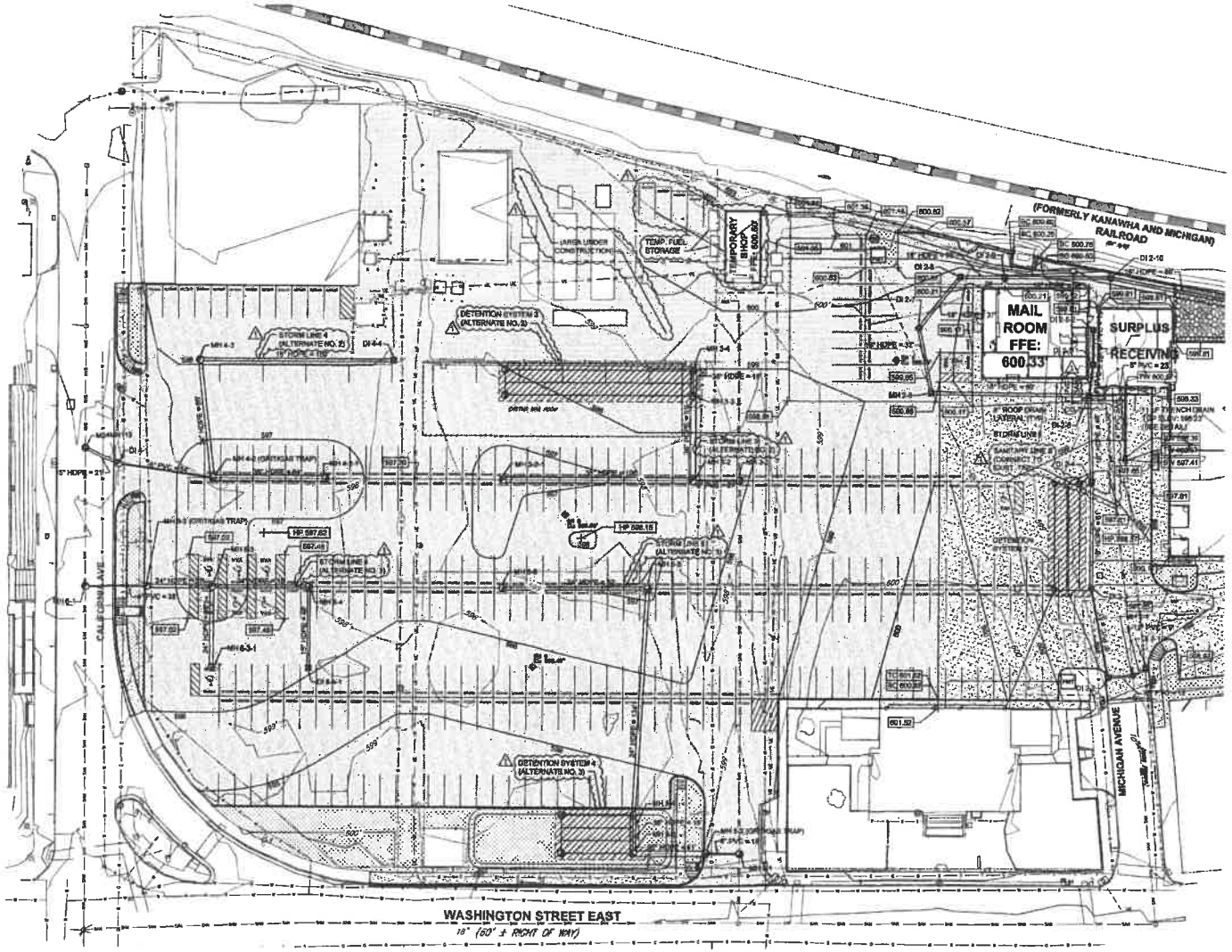
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PROJECT INFORMATION
West Virginia Department of Administration
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SITE LAYOUT AND MATERIALS PLAN - EAST

ROGER A. KENNEDY, No. 237, PROFESSIONAL LANDSCAPE ARCHITECT, STATE OF WEST VIRGINIA, 11-4-21

JOB NUMBER:	19027
SCALE:	1" = 30'
DATE:	AUGUST 5, 2021
DRAWN BY:	CTG
DESIGNED BY:	RJK
CHECKED BY:	JCB
SHEET NO.	C-0-104
REVISION	1



DRAINAGE INFORMATION

MH 2-1
TOP EL: 597.96'
INV. IN: 591.26' (DI 2-2)
INV. IN: 591.26' (DI 2-1-1)

DI 2-1-1
TOP EL: 597.71'
INV. OUT: 591.34'

DI 2-2
TOP EL: 596.00'
INV. IN: 591.50'
INV. OUT: 591.40'

DI 2-3
TOP EL: 597.85'
INV. IN: 592.11'
INV. OUT: 592.01'

MH 2-4
TOP EL: 597.03'
INV. IN: 592.57'
INV. OUT: 592.47'

DI 2-5
TOP EL: 600.00'
INV. IN: 592.98' (MH 2-6)
INV. IN: 592.96' (TRENCH DRAIN)
INV. IN: 597.06' (DI 2-5-1)
INV. OUT: 592.86'

DI 2-6
TOP EL: 599.76'
INV. IN: 593.59'
INV. OUT: 593.49'

DI 2-7
TOP EL: 599.33'
INV. IN: 593.91'
INV. OUT: 593.81'

DI 2-8
TOP EL: 599.65'
INV. IN: 594.23'
INV. OUT: 594.13'

DI 2-9
TOP EL: 600.00'
INV. IN: 594.48'
INV. OUT: 594.38'

MH 3-1
TOP EL: 597.87'
INV. IN: 591.55'

MH 3-2
TOP EL: 597.20'
INV. IN: 591.95' (MH 3-3)
INV. IN: 591.95' (MH 3-2-1)
INV. OUT: 591.85'

MH 3-3
TOP EL: 598.70'
INV. IN: 592.87'
INV. OUT: 592.47'

MH 3-4
TOP EL: 599.10'
INV. OUT: 592.71'

M24/MH113
TOP EL: 596.85'
INV. IN: 591.86'

DI 4-1
TOP EL: 597.34'
INV. IN: 592.05'
INV. OUT: 591.95'

MH 4-2
TOP EL: 596.82'
INV. IN: 593.30' (MH 4-3)
INV. IN: 592.98' (MH 4-2-1)
INV. OUT: 592.88'

MH 4-3
TOP EL: 598.00'
INV. IN: 594.44'
INV. OUT: 594.34'

DI 4-4
TOP EL: 597.80'
INV. OUT: 596.30'

MH 5-1
TOP EL: 599.51'
INV. IN: 590.74'

MH 5-2
TOP EL: 598.99'
INV. IN: 591.03'
INV. OUT: 590.93'

MH 5-3
TOP EL: 598.00'
INV. IN: 591.44'
INV. OUT: 591.34'

MH 5-4
TOP EL: 598.00'
INV. IN: 591.95'
INV. OUT: 591.56'

MH 5-5
TOP EL: 599.85'
INV. IN: 593.06'
INV. OUT: 592.96'

MH 5-6
TOP EL: 597.15'
INV. OUT: 593.69'

MH 6-1
TOP EL: 597.43'
INV. IN: 591.82'

MH 6-2
TOP EL: 597.73'
INV. IN: 592.06'
INV. OUT: 591.96'

MH 6-3
TOP EL: 596.80'
INV. IN: 592.63' (MH 6-4)
INV. IN: 592.63' (MH 6-3-1)
INV. OUT: 592.43'

MH 6-4
TOP EL: 597.16'
INV. IN: 592.83'
INV. OUT: 593.07'

NOTE:
FOLLOW GRIT/BAS TRAP DETAIL FOR STORM STRUCTURES MH 4-2, MH 5-2, AND MH 6-2. SEE SHEET C-0-507 FOR DETAIL.

REVISION NUMBER	REVISIONS	DATE	BY
1	ADD TEMP. SHOP, TAG STORM SYSTEM ALTERNATES	11/5/2021	RJK

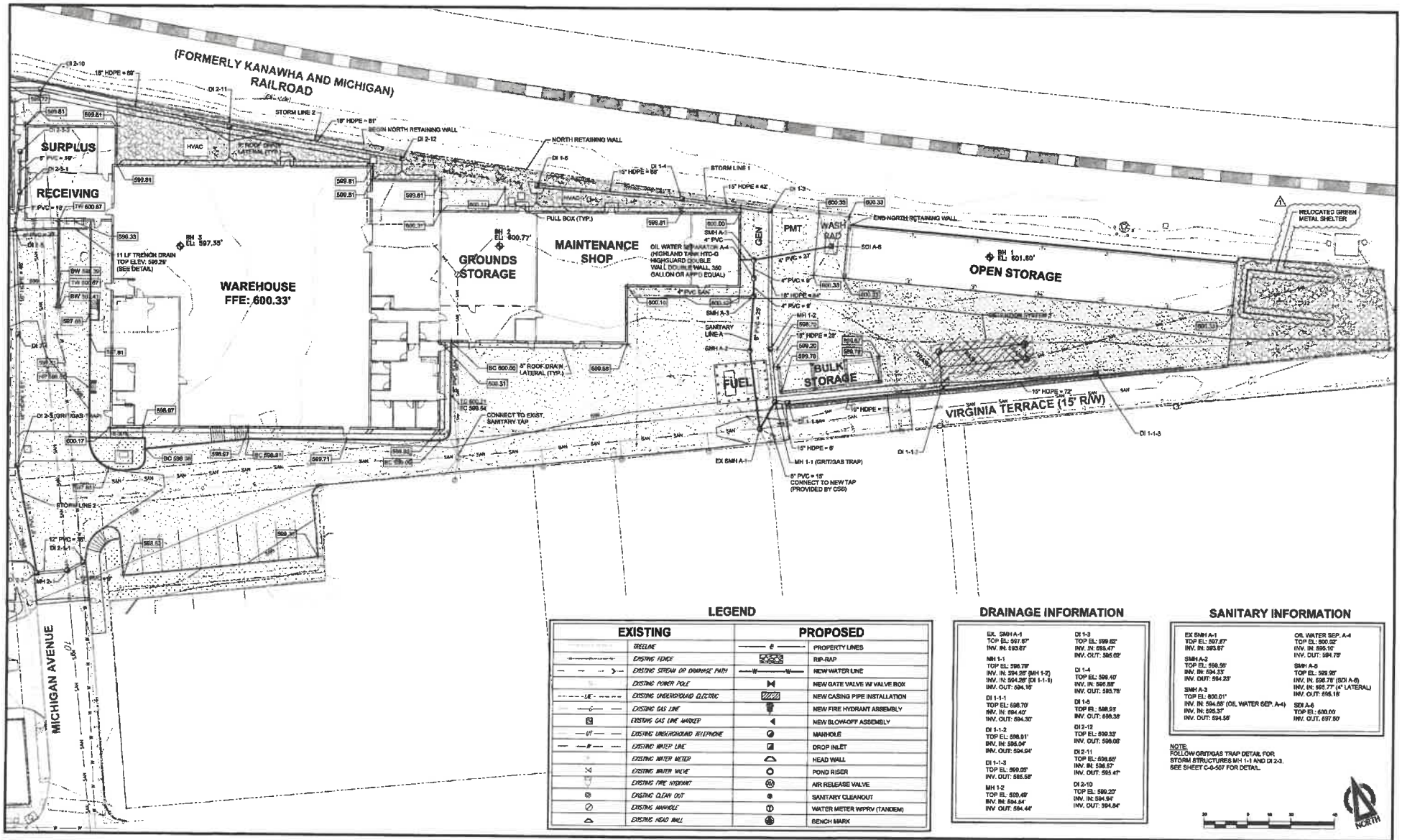
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SURVEYING
St. Albans, WV (304) 727-5501
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www.cheptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE GRADING AND DRAINAGE PLAN - WEST

ROGER J. KENNEDY — No. 21792 — STATE OF WEST VIRGINIA — PROFESSIONAL LANDSCAPE ARCHITECT
11-5-21

JOB NUMBER:	19027
SCALE:	1" = 30'
DATE:	AUGUST 6, 2021
DRAWN BY:	RJK
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-105
REVISION	1



LEGEND

EXISTING		PROPOSED
TREELINE		PROPERTY LINES
EXISTING FENCE		RIP-RAP
EXISTING STREAM OR DRAINAGE PATH		NEW WATER LINE
EXISTING POWER POLE		NEW GATE VALVE W/ VALVE BOX
EXISTING UNDERGROUND ELECTRIC		NEW CASING PIPE INSTALLATION
EXISTING GAS LINE		NEW FIRE HYDRANT ASSEMBLY
EXISTING GAS LINE MARKER		NEW BLOW-OFF ASSEMBLY
EXISTING UNDERGROUND TELEPHONE		MANHOLE
EXISTING WATER LINE		DROP INLET
EXISTING WATER METER		HEAD WALL
EXISTING WATER VALVE		POND RISER
EXISTING FIRE HYDRANT		AIR RELEASE VALVE
EXISTING CLEAN OUT		SANITARY CLEANOUT
EXISTING MANHOLE		WATER METER W/PRV (TANDEM)
EXISTING HEAD WALL		BENCH MARK

DRAINAGE INFORMATION

EX. SMH A-1
TOP EL: 597.67'
INV. IN: 593.67'

MH 1-1
TOP EL: 598.78'
INV. IN: 594.28' (MH 1-2)
INV. IN: 594.28' (DI 1-1-1)
INV. OUT: 594.18'

DI 1-1-1
TOP EL: 598.70'
INV. IN: 594.40'
INV. OUT: 594.30'

DI 1-1-2
TOP EL: 598.01'
INV. IN: 595.04'
INV. OUT: 594.94'

DI 1-1-3
TOP EL: 599.05'
INV. OUT: 595.58'

MH 1-2
TOP EL: 599.49'
INV. IN: 594.54'
INV. OUT: 594.44'

DI 1-3
TOP EL: 599.62'
INV. IN: 595.47'
INV. OUT: 595.02'

DI 1-4
TOP EL: 598.40'
INV. IN: 595.55'
INV. OUT: 595.75'

DI 1-5
TOP EL: 598.93'
INV. OUT: 595.38'

DI 2-12
TOP EL: 599.33'
INV. OUT: 595.08'

DI 2-11
TOP EL: 599.65'
INV. IN: 595.57'
INV. OUT: 595.47'

DI 2-10
TOP EL: 599.20'
INV. IN: 594.94'
INV. OUT: 594.84'

SANITARY INFORMATION

EX SMH A-1
TOP EL: 597.67'
INV. IN: 593.67'

SMH A-2
TOP EL: 599.55'
INV. IN: 594.33'
INV. OUT: 594.23'

SMH A-3
TOP EL: 600.01'
INV. IN: 594.58' (OIL WATER SEP. A-4)
INV. IN: 595.37'
INV. OUT: 594.58'

OIL WATER SEP. A-4
TOP EL: 600.02'
INV. IN: 595.10'
INV. OUT: 594.75'

SMH A-5
TOP EL: 599.95'
INV. IN: 596.78' (SDI A-6)
INV. IN: 595.77' (4" LATERAL)
INV. OUT: 595.15'

SDI A-6
TOP EL: 600.00
INV. OUT: 597.50'

NOTE:
FOLLOW GRIT/GAS TRAP DETAIL FOR STORM STRUCTURES MH 1-1 AND DI 2-3. SEE SHEET C-0-507 FOR DETAIL.

NORTH

REVISION NUMBER	REVISIONS	DATE	BY
1	RELOCATE GREEN SHELTER	11/5/2021	RJK

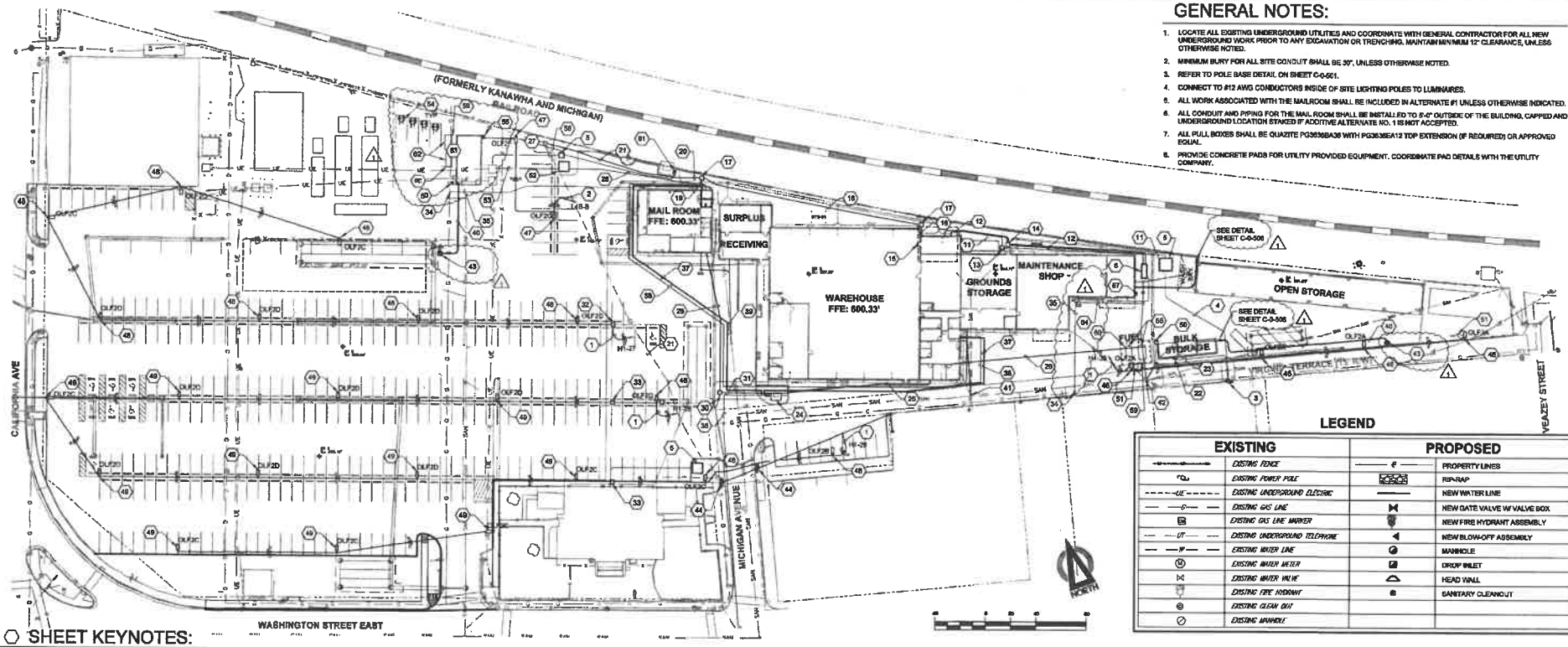
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE GRADING AND DRAINAGE PLAN - EAST

ROGER J. KENNEDY No. 887 PROFESSIONAL LANDSCAPE ARCHITECT STATE OF WEST VIRGINIA
11-5-21

JOB NUMBER:	19027
SCALE:	1" = 20'
DATE:	AUGUST 6, 2021
DRAWN BY:	FLB
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-106	1



GENERAL NOTES:

1. LOCATE ALL EXISTING UNDERGROUND UTILITIES AND COORDINATE WITH GENERAL CONTRACTOR FOR ALL NEW UNDERGROUND WORK PRIOR TO ANY EXCAVATION OR TRENCHING. MAINTAIN MINIMUM 12" CLEARANCE, UNLESS OTHERWISE NOTED.
2. MINIMUM BURY FOR ALL SITE CONDUIT SHALL BE 30", UNLESS OTHERWISE NOTED.
3. REFER TO POLE BASE DETAIL ON SHEET C-0-501.
4. CONNECT TO #12 AWG CONDUCTORS INSIDE OF SITE LIGHTING POLES TO LUMINAIRES.
5. ALL WORK ASSOCIATED WITH THE MAILROOM SHALL BE INCLUDED IN ALTERNATE #1 UNLESS OTHERWISE INDICATED.
6. ALL CONDUIT AND PIPING FOR THE MAIL ROOM SHALL BE INSTALLED TO 5'-0" OUTSIDE OF THE BUILDING, CAPPED AND UNDERGROUND LOCATION STAKED IF ADDITIVE ALTERNATE NO. 1 IS NOT ACCEPTED.
7. ALL PULL BOXES SHALL BE QUAZITE PG3636BA36 WITH PG3636EA12 TOP EXTENSION (IF REQUIRED) OR APPROVED EQUAL.
8. PROVIDE CONCRETE PADS FOR UTILITY PROVIDED EQUIPMENT. COORDINATE PAD DETAILS WITH THE UTILITY COMPANY.

LEGEND

EXISTING		PROPOSED	
	EXISTING FENCE		PROPERTY LINES
	EXISTING POWER POLE		RIP-RAP
UE	EXISTING UNDERGROUND ELECTRIC		NEW WATER LINE
G	EXISTING GAS LINE		NEW GATE VALVE W/ VALVE BOX
	EXISTING GAS LINE MARKER		NEW FIRE HYDRANT ASSEMBLY
UT	EXISTING UNDERGROUND TELEPHONE		NEW BLOW-OFF ASSEMBLY
W	EXISTING WATER LINE		MANHOLE
	EXISTING WATER METER		DROP INLET
	EXISTING WATER VALVE		HEAD WALL
	EXISTING FIRE HYDRANT		SANITARY CLEANOUT
	EXISTING CLEAN OUT		
	EXISTING MANHOLE		

SHEET KEYNOTES:

1. ROUTE INDICATED EXTERIOR LIGHTING CIRCUIT VIA EXTERIOR LIGHTING CONTACTOR, REFER TO DETAIL ON E-501. SEE PANEL SCHEDULE FOR REQUIRED CONDUIT/CONDUCTORS.
2. ROUTE INDICATED EXTERIOR LIGHTING CIRCUIT VIA EXTERIOR LIGHTING CONTACTOR, REFER TO DETAIL ON E-500. SEE PANEL SCHEDULE FOR REQUIRED CONDUIT/CONDUCTORS. CIRCUIT SHALL BE INCLUDED IN ALTERNATE #1.
3. NEW UTILITY SERVICE POLE. COORDINATE WITH AMERICAN ELECTRIC POWER.
4. UNDERGROUND PRIMARY ELECTRIC SERVICE FROM NEW UTILITY POLE.
5. NEW UTILITY-OWNED, PAD-MOUNT, TRANSFORMER (SIZE BY AMERICAN ELECTRIC POWER)
6. NEW NATURAL GAS FIRED GENERATOR. REFER TO ELECTRICAL RISER ON E-1-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
7. NOT USED
8. NOT USED
9. NOT USED
10. NOT USED
11. WAREHOUSE/GROUNDS BUILDING SECONDARY ELECTRICAL SERVICE. REFER TO E-1-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
12. GENERATOR CONNECTIONS. REFER TO E-1-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
13. INGROUND PULL BOX FOR SECONDARY ELECTRICAL SERVICE.
14. INGROUND PULL BOX FOR GENERATOR CONNECTIONS.
15. LOCATION OF EXISTING GROUNDS MECHANIC SHOP (GMS). NO WORK SHALL BE PERFORMED IN THIS AREA UNTIL NEW PHASE 1A GMS IS COMPLETED AND OPERATIONAL.
16. PROVIDE TWO (2) 2" CONDUITS UNDERGROUND FOR FIBER SERVICE. REFER TO E-1-108 FOR CONTINUATION INTO THE BUILDING.
17. INGROUND PULL BOX FOR FIBER SERVICE.
18. PROVIDE TWO (2) 2" CONDUITS UNDERGROUND FOR FIBER SERVICE. REFER TO E-1-108 FOR CONTINUATION.
19. PROVIDE ONE (1) 2" CONDUIT UNDERGROUND FOR FIBER SERVICE AS PART OF ALTERNATE #1. REFER TO E-3-103 FOR CONTINUATION.
20. PROVIDE THREE (3) 2" CONDUIT UNDERGROUND FOR FIBER SERVICE. CONDUITS SHALL BE CONNECTED TO EXISTING SPARE CONDUITS FOR FIBER CONNECTIONS TO CAMPUS NETWORK.
21. EIGHT (8) 2" UNDERGROUND CONDUITS FOR FUTURE CONNECTIONS TO FIBER SERVICE. CONDUITS INSTALLED UNDER PREVIOUS CONSTRUCTION CONTRACT.
22. BULK STORAGE BUILDING SERVICE PANEL.
23. PROVIDE SECONDARY ELECTRICAL SERVICE UNDERGROUND FROM POLE MOUNTED TRANSFORMER TO BULK STORAGE BUILDING SERVICE PANEL. REFER TO RISER ON E-2-100 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
24. FIRE PROTECTION VAULT. CONNECT 1-1/2" SUMP DISCHARGE TO DI 2-2. SEE SHEET C-0-105. SUMP SHALL BE POWERED VIA GFI RECEPTACLE CONNECTED TO BREAKER L1-23.
25. PROVIDE UNDERGROUND 1" CONDUIT FROM FIRE VAULT TO WAREHOUSE/GROUNDS FIRE ALARM CONTROL PANEL. REFER TO E-1-108 FOR CONTINUATION.
26. PROVIDE UNDERGROUND 1" CONDUIT FROM FIRE VAULT TO MAILROOM FIRE ALARM CONTROL PANEL, IN ALTERNATE #1. REFER TO E-3-103 FOR CONTINUATION.
27. UNDERGROUND PRIMARY ELECTRIC SERVICE FROM EXISTING SECTIONALIZING CABINET.
28. MAILROOM SECONDARY ELECTRICAL SERVICE INCLUDED IN ALTERNATE #1. REFER TO E-3-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
29. PROVIDE POWER AND CONTROL CONDUITS FOR FUEL SYSTEMS. REFER TO E-1-104 & E-1-108 FOR CONTINUATION AND ADDITIONAL REQUIREMENTS.
30. PROVIDE PULL BOX FOR MAILROOM FIRE ALARM CONNECTIONS IN BASE BID. PULL BOX SHALL NOT BE INSTALLED IF ALTERNATE #1 IS ACCEPTED.
31. CONDUIT FROM FIRE VAULT TO PULL BOX SHALL BE INCLUDED IN BASE BID.
32. PROVIDE PULL BOX AND UNDERGROUND CONDUIT TO PANEL IN BASE BID, PULL BOX NOT REQUIRED IS ALTERNATE #2 IS ACCEPTED.
33. PROVIDE PULL BOX AND CONDUIT UNDERGROUND TO PANEL IN BASE BID, PULL BOX NOT REQUIRED IF ALTERNATE #3 IS ACCEPTED.
34. NATURAL GAS SERVICE CONNECTION BY MOUNTAINEER GAS CO. TO BE INCLUDED IN ALTERNATE # 1.
35. INSTALL GAS LINE AND RISERS - 3"IR FOR THE WAREHOUSE AND 1-1/4"IR FOR THE MAIL ROOM
36. NEW WATER MAIN INSTALLED BY WV AMERICAN WATER CO..
37. PROVIDE 2" PE DOMESTIC WATERLINE.
38. PROVIDE 6" PE FIRE PROTECTION WATERLINE.
39. INSTALL 4" PVC SANITARY SEWER. CONNECT TO EXISTING TAP.
40. PROVIDE 1" DOMESTIC WATER SERVICE @ LOCATIONS. SEE DETAIL SHEET C-0-505.
41. INSTALL 6" PVC SANITARY SEWER. CONNECT TO EXISTING TAP.
42. INSTALL 6" PVC SANITARY SEWER. CONNECT TO NEW TAP. TAP INSTALLED BY CHARLESTON SANITARY BOARD.
43. NEW TAP BY WV AMERICAN WATER CO. @ LOCATIONS.
44. EXISTING UTILITY POLE.
45. NOT USED.
46. PROVIDE LIGHT FIXTURE AS PART OF BASE BID.
47. PROVIDE LIGHT FIXTURE AS PART OF ALTERNATE #1.
48. PROVIDE LIGHT FIXTURE AS PART OF ALTERNATE #2.
49. PROVIDE LIGHT FIXTURE AS PART OF ALTERNATE #3.
50. WEATHERPROOF, EMERGENCY SHUT OFF FOR FUEL SYSTEM.
51. GSD AGENCY CAMERA. PROVIDE SECURITY CAMERA 16'-0" AFG MOUNT SITE LIGHT POLE. REFER TO CAMERA RISER ON E-1-903.
52. NEW UTILITY-OWNED, PAD-MOUNT, TRANSFORMER (SIZE BY AMERICAN ELECTRIC POWER) INCLUDED IN ALTERNATE #1.
53. UNDERGROUND PRIMARY ELECTRIC SERVICE FROM EXISTING SECTIONALIZING CABINET INCLUDED IN ALTERNATE #1.
54. PROVIDE PEDESTAL MOUNTED WEATHERPROOF RECEPTACLE FOR VEHICLE BLOCK HEATER. SEE EQUIPMENT SUPPORT BRACKET DETAIL ON SHEET E-502.
55. PROVIDE PANEL L5, IN NEMA 3R ENCLOSURE WITH METERBASE. EQUIPMENT SHALL BE MOUNTED ON GROUND MOUNTED FREE STANDING SUPPORT RACK AT VEHICLE SHELTER.
56. PROVIDE WIRING FROM FUEL PUMPS VIA EMERGENCY SHUT OFF BUTTON TO PANEL L5.
57. OIL WATER SEPARATOR ALARM PANEL.
58. PROVIDE 3#3/0 IN 2" CONDUIT FROM GROUND MOUNTED TRANSFORMER TO VEHICLE STORAGE PANEL. SERVICE ENTRANCE AND CONDUIT PER AEP REQUIREMENTS.
59. PROVIDE 1/2" GROUND ROD FOR FUEL SYSTEM LIGHTNING PROTECTION SYSTEM.
60. RELOCATED FUEL TANKS - THE AREA WITHIN THE DISPENSING AREA SHALL BE CLASSIFIED AS CLASS I, DIVISION 1 AND THE AREA WITHIN 20 FEET OF ANY EDGE OF THE TANKS AND 18 INCHES ABOVE GRADE SHALL BE CLASSIFIED AS CLASS I, DIVISION 2. ANY EQUIPMENT WITHIN THE CLASSIFIED AREA SHALL BE UL LISTED FOR THAT AREA. ALL WIRING METHODS SHALL CONFORM TO THE REQUIREMENTS OF NEC ARTICLES 500, 501, AND 514. ALL CONDUITS ENTERING/EXITING THE HAZARDOUS AREA SHALL HAVE SEALING FITTINGS BEFORE CROSSING THE AREA BOUNDARY.
61. NEW ELECTRICAL SERVICE FOR WVDOH OWNED LIGHT. INSTALL COMBINATION METER BASE, CONNECT TO EXISTING PANEL. SERVICE ENTRANCE AND CONDUIT PER AEP REQUIREMENTS.
62. PROVIDE WIRING FROM FUEL PUMPS VIA EMERGENCY SHUT OFF BUTTON TO PANEL L5.
63. TEMPORARY FUEL TANK LOCATION. TANKS, EQUIPMENT AND CONTROLS SHALL BE MOVED TO FINAL LOCATION AFTER WAREHOUSE BUILDING HAS BEEN COMPLETED.
64. INSTALL 4" SANITARY SEWER AS PART OF SANITARY LINE A.

REVISION NUMBER	REVISIONS	DATE	BY
1	ADD TEMP. SHOP UTILITY SERVICES, DEL NOTES 7-10	11/05/2021	RJK/KGM

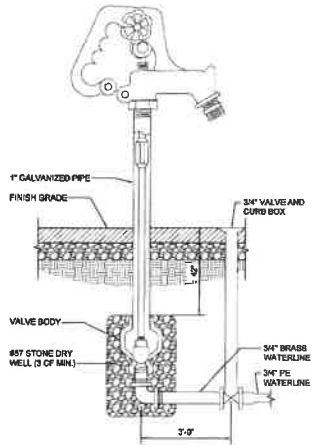
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE UTILITY PLAN

PROFESSIONAL LANDSCAPE ARCHITECT ROGER J. KEANEY WV 222 11-5-21

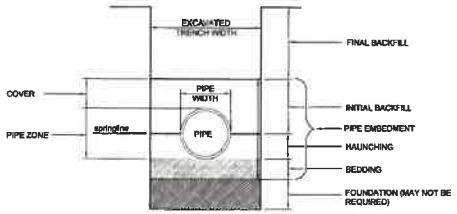
JOB NUMBER:	19077
SCALE:	1" = 40'
DATE:	AUGUST 6, 2021
DRAWN BY:	RJK/KGM
DESIGNED BY:	RJK/KGM
CHECKED BY:	JEB
SHEET NO.	C-0-107
REVISION	1



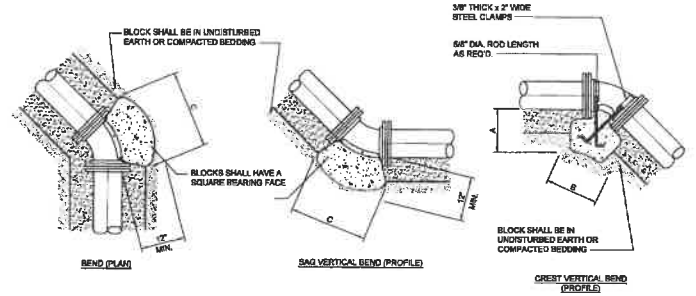
GROUND HYDRANT DETAIL

SCALE: NONE

NOTE: HYDRANT SHALL BE MURDOCK NON-FREEZE POST HYDRANT MODEL M-3804 OR APPROVED EQUAL.



PIPE EMBEDMENT DETAIL (SHOWN FOR TERMINOLOGY)

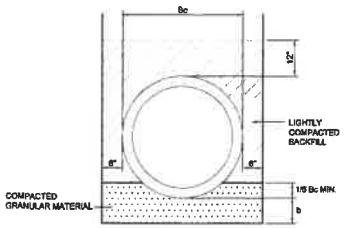


BEND (PLAN)

SAG VERTICAL BEND (PROFILE)

CREST VERTICAL BEND (PROFILE)

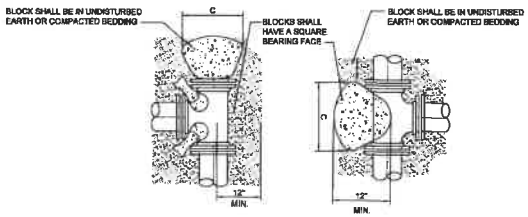
NOTE:
BEDDING THICKNESS UNDER PIPE BARREL, b, SHALL BE 1/8 Bc, 4" MIN., 6" MAX.



CLASS 'C' BEDDING GRANULAR

TRENCH BEDDING DETAILS

SCALE: NONE (0271906)



DEAD END (PLAN)

TEE (PLAN)

THRUST BLOCK DIMENSIONS																			
PIPE SIZE	90 DEG.			45 DEG.			22.5 DEG.			11.25 DEG.			TEE			DEAD END		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
4"	---	---	22"	35"	18"	28"	28"	12"	22"	22"	6"	---	---	---	22"	---	---	19"
6"	---	---	32"	44"	23"	36"	35"	17"	28"	28"	12"	---	---	---	32"	---	---	27"
8"	---	---	42"	53"	31"	43"	43"	22"	34"	34"	16"	---	---	---	42"	---	---	35"
10"	---	---	51"	61"	38"	49"	49"	27"	39"	39"	19"	---	---	---	51"	---	---	43"
12"	---	---	61"	68"	45"	55"	55"	32"	43"	43"	23"	---	---	---	61"	---	---	51"
14"	---	---	71"	76"	52"	60"	60"	37"	48"	48"	26"	---	---	---	71"	---	---	59"
16"	---	---	80"	82"	59"	66"	66"	42"	52"	52"	30"	---	---	---	80"	---	---	67"
24"	---	---	119"	107"	86"	86"	86"	63"	68"	68"	44"	---	---	---	119"	---	---	100"

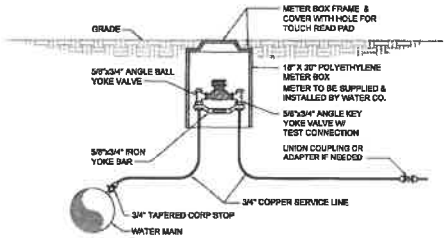
* DIMENSIONS SHOWN ARE FOR 200 PSI WATER PRESSURE FOR DUCTILE IRON AND PVC PIPE WITH ALLOWABLE SOIL BEARING PRESSURE OF 2000 PSF.

* THRUST BLOCKING IS NOT REQUIRED FOR PIPE SMALLER THAN 4"

NOTES:
1. INSTALL THRUST BLOCKING IN ACCORDANCE WITH THE FOLLOWING SCHEDULE FOR PIPES 4" AND LARGER AT ALL BENDS 11-1/4 DEGREES OR GREATER AT ALL TEES, CROSSES, REDUCERS, PLUGS AND OTHER FITTINGS.
2. CREST VERTICAL BEND BLOCK WIDTH SHALL BE 24" MIN. FOR 8" AND 10" PIPE.
3. LEAVE ALL FLANGES FREE AND CLEAR FOR MAINTENANCE.

TYPICAL CONCRETE THRUST BLOCKING

SCALE: NONE



METER ASSEMBLY DETAIL

SCALE: NONE 0288501 ⚠

REVISION NUMBER	REVISIONS	DATE	BY
⚠	ADD METER ASSY. DETAIL	11/8/2021	RJK

Chapman Technical Group, a division of CEC

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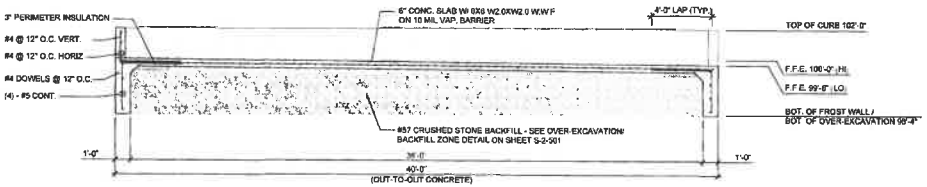
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

UTILITY DETAILS

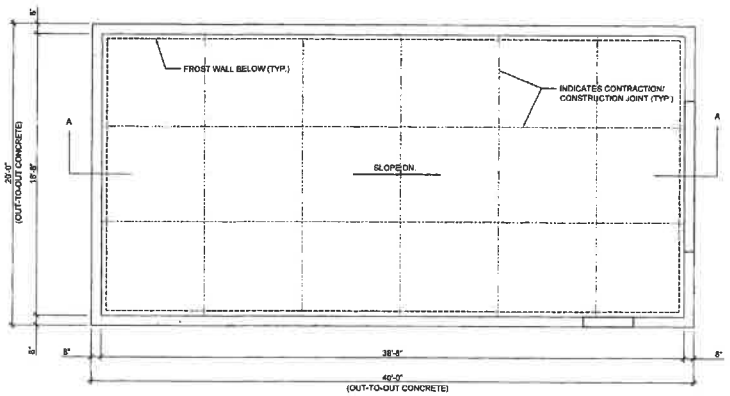


JOB NUMBER	19027
SCALE	AS NOTED
DATE	AUGUST 6, 2021
DRAWN BY	LDA
DESIGNED BY	RJK
CHECKED BY	JEB
SHEET NO.	C-0-506
REVISION	⚠

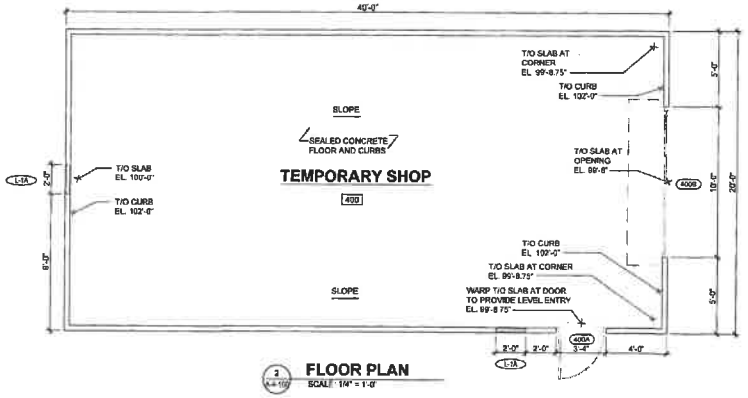


SECTION A-A

NOTE: FOUNDATION DRAWING IS FOR CONTRACTOR ESTIMATING PURPOSES ONLY. FINAL FOUNDATION DESIGN WILL BE PROVIDED AFTER BUILDING SHOP DRAWING REVIEW.



1 FOUNDATION PLAN
A-4-100 SCALE: 1/4" = 1'-0"



2 FLOOR PLAN
A-4-100 SCALE: 1/4" = 1'-0"

DOOR SCHEDULE

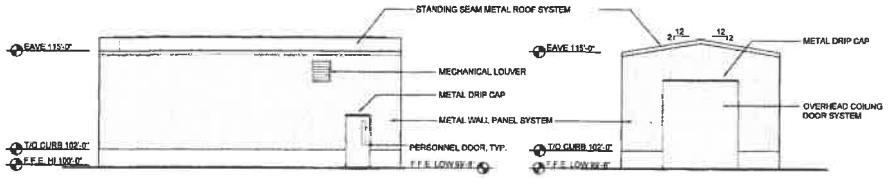
DOOR NO.	SIZE	DOOR MAT.	DOOR FINISH	DOOR ELEV.	DOOR LABEL	DOOR HDW. SET	FRAME MAT.	FRAME FINISH	FRAME TYPE	REMARKS
400A	3'-0"x 7'-0"	HM	PTD	A	60 MIN	16	HM	PTD	A	NOTE 1
4008	10'-0"x 12'-0"	GV	FAC	E	-	1	STL	PTD	-	NOTE 2,3,5

FAC- FACTORY
GV- GALVANIZED
HM- HOLLOW METAL
INS- INSULATED
PTD- PAINTED
STL- STEEL

NOTES:
1. PROVIDE INSULATED DOOR SYSTEM.
2. PROVIDE TRIM AT ALL OVERHEAD DOORS ENCASING STEEL FRAMES
3. MANUAL OVERHEAD DOOR WITH CHAIN HOIST.
4. SEE DOOR DETAILS A-510 AND A-511, SIMILAR.
5. TUBE STEEL BUILDING'S STANDARD OVERHEAD COILING DOOR SYSTEM WITH CHAIN HOIST MAY BE USED IN LIEU OF ABOVE NOTED DOOR

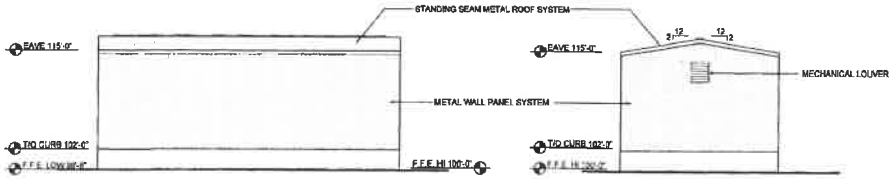
TUBE STEEL STRUCTURE

1. PROVIDE TUBE STEEL STRUCTURE FOR USE AS TEMPORARY SHOP THROUGHOUT CONSTRUCTION. THE TEMPORARY SHOP MUST BE IN PLACE AND OCCUPIABLE PRIOR TO DEMOLITION OF EXISTING SHOP SPACE. ONCE CONSTRUCTION OF THE NEW SHOP IS SUBSTANTIALLY COMPLETE, SHOP OPERATIONS WILL BE RELOCATED TO THE NEW SHOP AND THE SPACE WILL BE USED AS A PARKING AREA. BASIS OF DESIGN - MILLENNIUM BUILDINGS, OR EQUAL.
2. BASIS OF DESIGN - MILLENNIUM BUILDINGS, OR EQUAL. WITH BENT RAIL CLIP ANCHORAGE SYSTEM. CENTER ANCHOR BOLTS ON CURB. EXTEND DOORS TO F.F.E.
3. PROVIDE SUBMITTALS FOR TEMPORARY SHOP BUILDING INCLUDING SHOP DRAWINGS AND MATERIAL PERFORMANCE REQUIREMENTS PER SPECIFICATIONS.
4. PROVIDE AN INSULATED TUBE STEEL BUILDING MEETING THE FOLLOWING PERFORMANCE REQUIREMENTS:
   A. FRAMING - MANUFACTURER'S GALVANIZED TUBE STEEL AS NECESSARY TO MEET STRUCTURAL REQUIREMENTS.
   B. SUB FRAMING - MANUFACTURER'S STANDARD STEEL SUB-FRAMING AS NECESSARY TO MEET STRUCTURAL REQUIREMENTS.
   C. SNOW LOAD - 30 PSF.
   D. WIND LOAD - 115 MPH, 3 SECOND GUST.
   E. SIDING - 29 GAUGE GALVANIZED, MINIMUM, 5 RIB SHEET STEEL, VERTICAL RIBBED ROOF AND WALLS, PRE-FINISHED. COLORS TO BE SELECTED FROM MANUFACTURER'S FULL RANGE OF COLORS.
   F. INSULATION - R-13 CLOSED CELL SPRAY FOAM AT ROOF AND WALLS. FORM AROUND OPENINGS AND ELECTRICAL WORK AS NECESSARY TO PROVIDE CLEARANCE FOR OPERATION.
   G. PROVIDE CONCRETE CURBS TO SET BUILDING. COORDINATE DOORS WITH SLOPED FLOOR.



3 ELEVATION
A-4-100 SCALE: 1/4" = 1'-0"

4 ELEVATION
A-4-100 SCALE: 1/4" = 1'-0"



5 ELEVATION
A-4-100 SCALE: 1/4" = 1'-0"

6 ELEVATION
A-4-100 SCALE: 1/4" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY
1	ADD TEMPORARY SHOP	11/08/21	PAW

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
TEMPORARY SHOP
PLANS, ELEVATIONS AND DETAILS

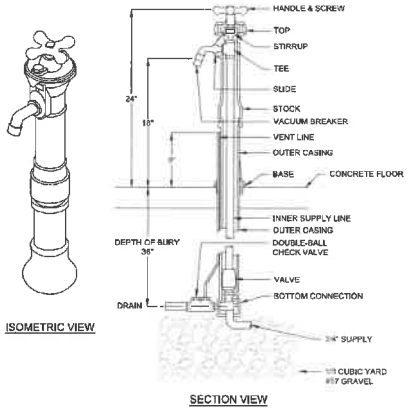
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DESIGNED BY:	DND
DRAWN BY:	PAW
CHECKED BY:	PAW
SHEET NO.	A-4-100
REVISION	1

SHEET KEYNOTES:

1. PROVIDE 3/4" MURDOCK MODEL M-E10-BFH (DOUBLE BALL CHECK VALVE AND VACUUM BREAKER) FREEZE RESISTANT POST HYDRANT FOR 3 FT. BURY AND INDOOR INSTALLATION. PROVIDE WITH "NON-POTABLE" SIGN.
2. 3/4" DOMESTIC WATER SUPPLY. SEE SITE UTILITIES PLAN FOR CONTINUATION.
3. OWNER PROVIDED PORTABLE EYEWASH/SHOWER TO BE LOCATED WITHIN OR NEAR THE BUILDING. LOCATION TO BE DETERMINED BY OWNER.



1 FLOOR PLAN - PLUMBING
SCALE: 1/4"=1'-0"



ISOMETRIC VIEW

SECTION VIEW

2 FREEZEPROOF POST HYDRANT INSTALLATION DETAIL
NOT TO SCALE

REVISION NUMBER	REVISIONS	DATE	BY
1	TEMPORARY SHOP BUILDING	11-05-21	CS

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
MAINTENANCE BUILDING
FLOOR PLAN - PLUMBING

JOB NUMBER:	19027
SCALE:	1/4" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CS
SHEET NO.	P-4-100
REVISION	1

LOUVER SCHEDULE

MARK	MANUFACTURER	MODEL	INTAKE / EXHAUST	SIZE WIDTH	SIZE HEIGHT	SIZE DEPTH	CFM	PRESSURE DROP (IN)	FREE AREA (SQ FT)	VELOCITY (FPM)	REMARKS
L-1A	GREENHECK	ESD-635	AS SHOWN ON PLAN	24	32	6	1300	0.034	2.7	477	1,2,3,4,5,6,8,9,11

REMARKS:
1. LOUVER COLOR SELECTED BY ARCHITECT
2. COORDINATE ALL LOUVER LOCATIONS WITH ARCHITECT AND ENGINEER PRIOR TO INSTALLATION
3. ALUMINUM CONSTRUCTION
4. DRAINABLE BLADES
5. STORM PROOF LOUVER
6. MAXIMUM NC LEVEL OF 25
7. NOT USED
8. PROVIDE BIRD SCREEN
9. PROVIDE INSECT SCREEN
10. NOT USED
11. PROVIDE WITH GRAVITY BACKDRAFT DAMPER

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: RUSKIN, UNITED ENERTECH. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

AIR DEVICE SCHEDULE

MARK	MANUFACTURER	MODEL	MAX CFM	MODULE	AIR PATTERN	NECK	MAX NC	REMARKS
EX-1A	PRICE	ANFCONCENTRIC RING NOZZLE DIFFUSER	1300	18"	-	16"	19	ALL

REMARKS:
1. COORDINATE AIR DEVICE LOCATIONS WITH REFLECTED CEILING PLANS PRIOR TO INSTALLATION. LIGHTING HAS PRIORITY OVER HVAC
2. DUCT MOUNTED
3. PROVIDE DUCT ADAPTER AND TRANSITION AS REQUIRED
4. COLOR TO BE SELECTED BY ARCHITECT

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: KRUEGER, TITUS. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

ELECTRIC HEATER SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	CFM	BTUH	ELECTRICAL V/Ø/Hz	ELECTRICAL KW	ELECTRICAL MCA	ELECTRICAL MOCP	REMARKS
EH-1A	TRANE	UHEC-072BACA	WALL MOUNTED	700	20,600	208/1/60	7.5	31.3A	40A	1,2, 3

REMARKS:
1. INTEGRAL DISCONNECT
2. PROVIDE REQUIRED MOUNTING BRACKET FOR MOUNTING AS INDICATED
3. MOUNT HEATER AS HIGH AS POSSIBLE UNLESS NOTED OTHERWISE IN PLAN

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: Q-MARK, REDDI. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

EXHAUST FAN SCHEDULE

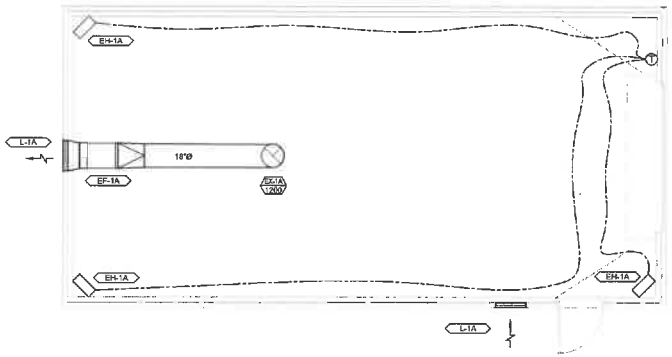
MARK	MANUFACTURER	MODEL	CFM	ESP (IN H2O)	SONES	DRIVE TYPE	RPM	ELECTRICAL V/Ø/Hz	ELECTRICAL HP	ELECTRICAL FLA	ELECTRICAL MOCP	REMARKS
EF-1A	GREENHECK	SQ-140-C	1261	0.25	6.1	Direct	650	115/60/1	1/6	1	15	ALL

REMARKS:
1 PROVIDE WITH UNIT MOUNTED DISCONNECT
2. PROVIDE WITH UNIT MOUNTED SPEED CONTROL
3 INLINE FAN
4. SUPPORT FROM THE STRUCTURE
5. FAN TO BE CONTROLLED USING ON/OFF CONTROLS BY WALL MOUNTED SWITCH

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: CARNES, COOK. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

SHEET KEYNOTES:

1. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 11'-0" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
2. FURNISH AND INSTALL INLINE EXHAUST FAN. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. MOUNT AS HIGH AS POSSIBLE FROM STRUCTURE. EXHAUST FAN SHALL BE ENABLED CONTINUOUSLY UNDER ON/OFF CONTROLS BY WALL MOUNTED SWITCH.
3. FURNISH AND INSTALL ELECTRIC HEATER. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. MOUNT AS HIGH AS POSSIBLE FROM STRUCTURE



1 FLOOR PLAN - MECHANICAL
SCALE: 1/4" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY
1	TEMPORARY SHOP BUILDING	11-05-21	CS

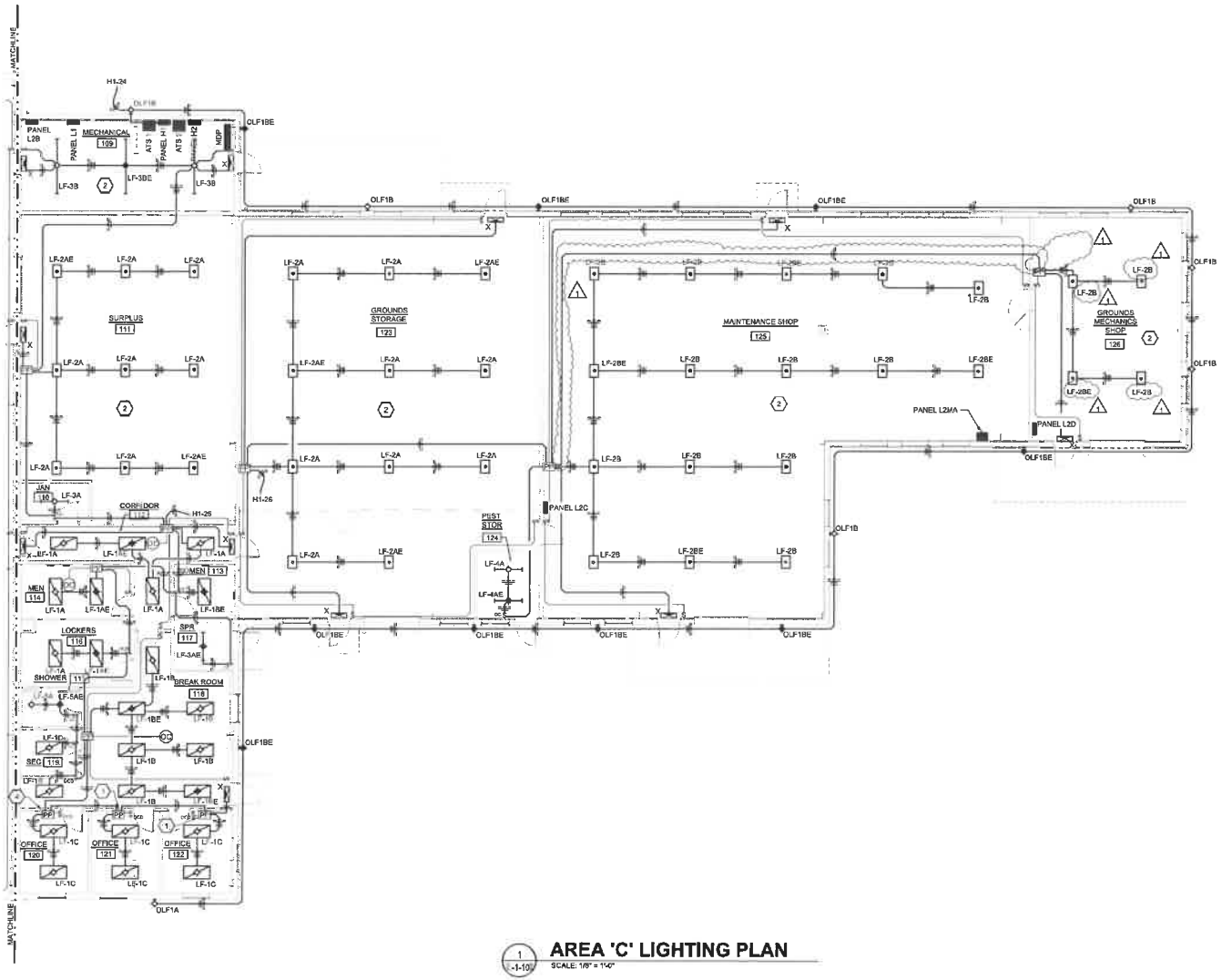
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
MAINTENANCE BUILDING
FLOOR PLAN - MECHANICAL

CHRISTOPHER S. SHAMBAUGH, REGISTERED PROFESSIONAL ENGINEER, STATE OF WEST VIRGINIA, 23225, 11/9/21

JOB NUMBER	19027
SCALE	1/4" = 1'-0"
DATE	AUGUST 6, 2021
DRAWN BY	BM
DESIGNED BY	BM
CHECKED BY	CS
SHEET NO.	M-4-100
REVISION	1



AREA 'C' LIGHTING PLAN

1 / E-1-102 — SCALE: 1/8" = 1'-0"

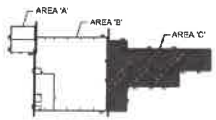
GENERAL NOTES:

1. REFER TO POWER PLANS FOR PANELBOARD LOCATIONS.
2. REFER TO SPECIFICATION SECTION 260548 FOR MOUNTING/SUPPORT REQUIREMENTS FOR LUMINAIRES.
3. OCCUPANCY SENSORS SHALL BE MOUNTED ON A VIBRATION FREE SURFACE AND SHALL BE LOCATED AT LEAST 6'-0" FROM DIFFUSERS. DO NOT MOUNT SENSORS CLOSER THAN 10'-0" FROM EACH OTHER.
4. PROVIDE AN UNSWITCHED LIGHTING CIRCUIT (NORMAL POWER) TO EACH LUMINAIRE CONTAINING AN EMERGENCY BATTERY DRIVER.
5. 0-10VDC DIMMING CONDUCTORS (CLASS 2) SHALL BE ROUTED IN SEPARATE CONDUIT FROM THE POWER CONDUCTORS.
6. LIGHTING CONTROL CABLE SHALL BE "DAISY CHAINED" BETWEEN LIGHTING CONTROL DEVICES (OCCUPANCY SENSOR, POWER/RELAY PACKS, WALL PODS, ETC.) WITHIN EACH ROOM AS SHOWN. CABLING SHALL BE ROUTED ABOVE CEILING AND SECURED WITH BRIDLE RINGS OR OTHER SIMILAR WIRE METHODS.
7. REFER TO ARCHITECTURAL ELEVATIONS FOR EXTERIOR LIGHT FIXTURE MOUNTING HEIGHTS.

SHEET KEYNOTES:

1. REFER TO POWER PLANS AND DETAILS FOR INTERCONNECTION TO RECEPTACLE CONTROL IN THIS AREA.
2. LUMINAIRES IN THIS AREA TO BE LOCATED AT 14'-0".





KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY
1	SEE REVISIONS	11/05/2021	KGM

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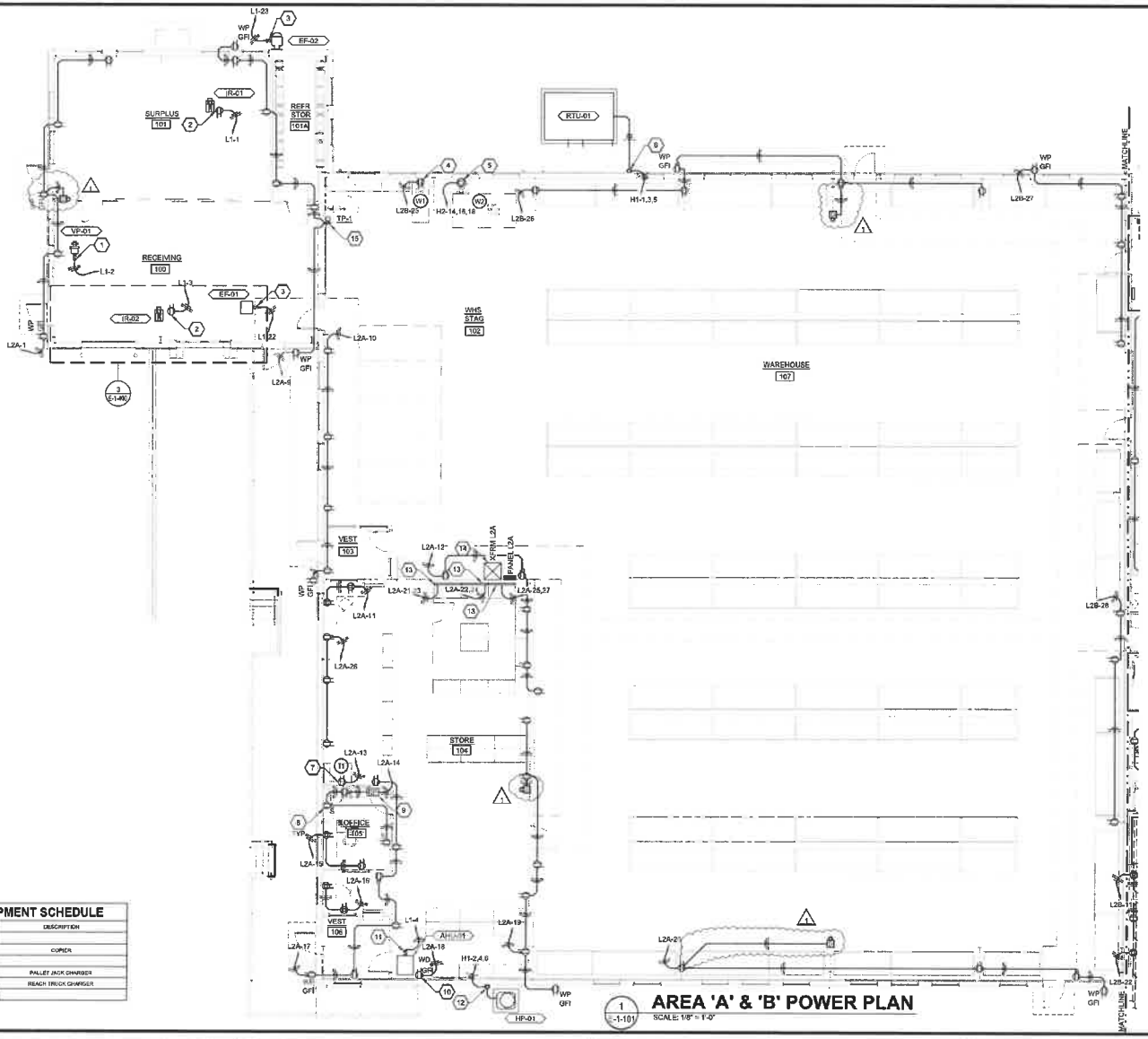
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www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
AREA 'C' LIGHTING PLAN

PATRICK JAYE BARDY — REGISTERED PROFESSIONAL ENGINEER — STATE OF WEST VIRGINIA — 11/05/21

JOB NUMBER	19027
SCALE	AS NOTED
DATE	AUGUST 6, 2021
DRAWN BY	KGM
DESIGNED BY	KGM
CHECKED BY	PJB
SHEET NO.	E-1-102
REVISION	1



AREA 'A' & 'B' POWER PLAN

1 / E-1-101 — SCALE: 1/8" = 1'-0"

GENERAL NOTES:

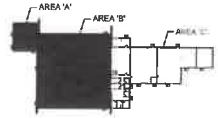
1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

SHEET KEYNOTES:

1. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR RADIANT HEATING PUMP.
2. PROVIDE NEMA 5-15 RECEPTACLE FOR RADIANT HEATING BURNER. MOUNT WITHIN 12" OF BURNER UNIT.
3. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH EXHAUST FAN.
4. PROVIDE NEMA 5-20 RECEPTACLE FOR PALLET JACK CHARGER. VERIFY RECEPTACLE TYPE WITH OWNER PROVIDED EQUIPMENT PRIOR TO INSTALLATION.
5. PROVIDE NEMA L16-20 RECEPTACLE FOR REACH TRUCK CHARGER. VERIFY RECEPTACLE TYPE WITH OWNER PROVIDED EQUIPMENT PRIOR TO INSTALLATION.
6. PROVIDE NEMA 3R 60 AMP NON FUSED SAFETY SWITCH FOR RTU.
7. PROVIDE NEMA 5-20 RECEPTACLE FOR COPIER.
8. OCCUPANCY CONTROLLED RECEPTACLE. PROVIDE LABEL ON FACEPLATE. "RECEPTACLE CONTROLLED BY OCCUPANCY SENSOR."
9. RECEPTACLE CONTROL POWER PACK. REFER TO LIGHTING PLANS AND DETAILS FOR INTERCONNECTION TO LIGHTING CONTROL IN THIS AREA.
10. PROVIDE NEMA 5-20 RECEPTACLE FOR WATER DISPENSER.
11. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR AHU.
12. PROVIDE NEMA 3R 30A THREE POLE NON-FUSED DISCONNECT FOR HP.
13. PROVIDE WALL MOUNTED 4' LONG PLUG STRIP (WIREMOLD AL20GBA406 OR EQUIVALENT) AT 48" AFF.
14. PROVIDE MOUNTING BRACKET FOR TRANSFORMER. MOUNT TOP OF TRANSFORMER AS CLOSE TO BOTTOM OF STRUCTURE AS POSSIBLE.
15. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.

EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
T1	COPIER
WT	PALLET JACK CHARGER
WC	REACH TRUCK CHARGER



KEYPLAN

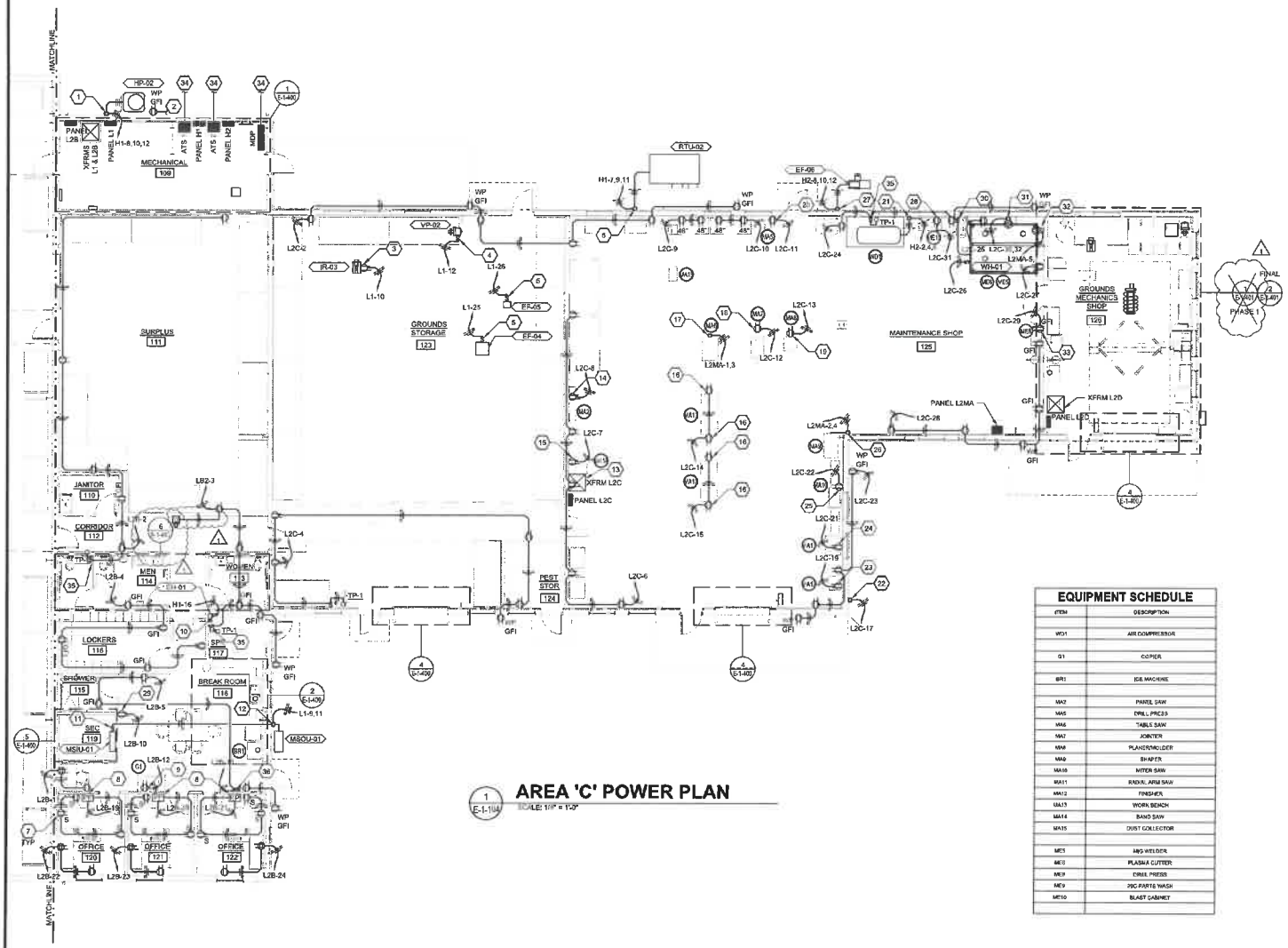
REVISION NUMBER	REVISIONS	DATE	BY
1	SEE REVISIONS	11/05/2021	KGM

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
AREA 'A' & 'B' POWER PLAN

JOB NUMBER	19027
SCALE	AS NOTED
DATE	AUGUST 6, 2021
DRAWN BY	KGM
DESIGNED BY	KGM
CHECKED BY	PJB
SHEET NO.	E-1-103
REVISION	1



EQUIPMENT SCHEDULE

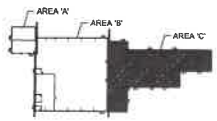
ITEM	DESCRIPTION
WO1	AIR COMPRESSOR
C1	COPIER
BR1	ICE MACHINE
MA2	PANEL SAW
MA5	DRILL PRESS
MA6	TABLE SAW
MA7	JOINTER
MA8	PLANER/MOLDER
MA9	SHAPER
MA10	MITER SAW
MA11	RADIAL ARM SAW
MA12	FINISHER
MA13	WORK BENCH
MA14	BAND SAW
MA15	DUST COLLECTOR
ME5	MIG WELDER
ME6	PLASMA CUTTER
ME8	DRILL PRESS
ME9	20C PARTS WASH
ME10	BLAST CABINET

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

SHEET KEYNOTES:

1. PROVIDE NEMA 3R 30A THREE POLE NON-FUSED DISCONNECT FOR HP.
2. SEE SHEET E-1-400, ENLARGED MECHANICAL ROOM, FOR CONTINUATION.
3. PROVIDE NEMA 5-15 RECEPTACLE FOR RADIANT HEATING BURNER. MOUNT WITHIN 12" OF BURNER UNIT.
4. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR RADIANT HEATING PUMP.
5. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH EXHAUST FAN.
6. PROVIDE NEMA 3R 30 AMP NON-FUSED SAFETY SWITCH FOR RTU.
7. OCCUPANCY CONTROLLED RECEPTACLE. PROVIDE LABEL ON FACEPLATE, "RECEPTACLE CONTROLLED BY OCCUPANCY SENSOR."
8. RECEPTACLE CONTROL POWER PACK. REFER TO LIGHTING PLANS AND DETAILS FOR INTERCONNECTION TO LIGHTING CONTROL IN THIS AREA.
9. PROVIDE NEMA 5-20 RECEPTACLE FOR COPIER.
10. PROVIDE ELECTRICAL CONNECTION TO INTEGRAL DISCONNECT IN ELECTRIC UNIT HEATER.
11. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH INDOOR MINI SPLIT UNIT.
12. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH OUTDOOR MINI SPLIT UNIT.
13. PROVIDE MOUNTING BRACKET FOR TRANSFORMER. MOUNT TOP OF TRANSFORMER AS CLOSE TO BOTTOM OF STRUCTURE AS POSSIBLE.
14. PROVIDE NEMA 5-20 RECEPTACLE FOR PANEL SAW.
15. PROVIDE NEMA 5-20 RECEPTACLE FOR BAND SAW.
16. PROVIDE FLOOR MOUNTED PEDESTAL NEMA 5-20 RECEPTACLES AT END OF WORKBENCHES.
17. PROVIDE NEMA 12, 20 AMP NON-FUSED DISCONNECT FOR TABLE SAW.
18. PROVIDE NEMA 5-20 RECEPTACLE FOR JOINTER.
19. PROVIDE NEMA 5-20 RECEPTACLE FOR PLANER/MOLDER.
20. PROVIDE NEMA 5-20 RECEPTACLE FOR DRILL PRESS.
21. PROVIDE NEMA 12, 30 AMP DISCONNECT FOR AIR COMPRESSOR.
22. PROVIDE NEMA 3R, 30 AMP DISCONNECT FOR SLIDE GATE.
23. PROVIDE NEMA 5-20 RECEPTACLE FOR FINISHER.
24. PROVIDE NEMA 5-20 RECEPTACLE FOR RADIAL ARM SAW.
25. PROVIDE NEMA 5-20 RECEPTACLE FOR MITER SAW.
26. PROVIDE NEMA 12, 30 AMP DISCONNECT FOR SHAPER.
27. PROVIDE NEMA 3R, 30 AMP DISCONNECT FOR EXHAUST FAN.
28. PROVIDE NEMA 5-20 RECEPTACLE FOR BLAST CABINET.
29. PROVIDE NEMA 5-20 RECEPTACLE FOR TIME CLOCK.
30. PROVIDE WIRING FOR WELDING HOOD CONTROL SWITCH. REFER TO MECHANICAL FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
31. PROVIDE NEMA 1, 30 AMP DISCONNECT WITH NEMA 10-30 RECEPTACLE FOR WELDER.
32. PROVIDE NEMA 1, 30 AMP DISCONNECT WITH NEMA L14-30 RECEPTACLE FOR PLASMA CUTTER.
33. PROVIDE NEMA 5-20 RECEPTACLE FOR DRILL PRESS.
34. REFER TO C-0-107 FOR CONTINUATION AND E-1-900 FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
35. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
36. FUEL TANK SYSTEM CONTROL PANEL.



KEYPLAN

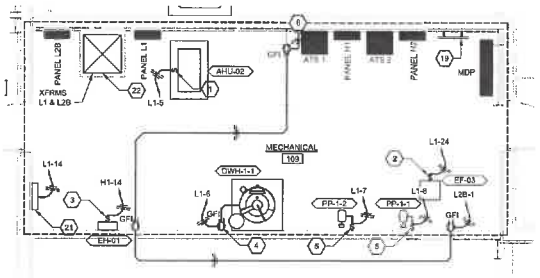
REVISION NUMBER	REVISIONS	DATE	BY
1	SEE REVISIONS	11/05/2021	KGM

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

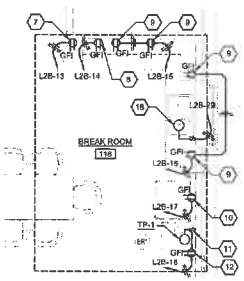
GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
AREA 'C' POWER PLAN

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	E-1-104
REVISION	1



1 E-1-400 ENLARGED MECHANICAL ROOM POWER PLAN

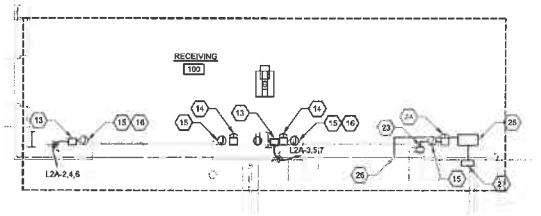
SCALE: 1/4" = 1'-0"



2 E-1-400 ENLARGED BREAKROOM POWER PLAN

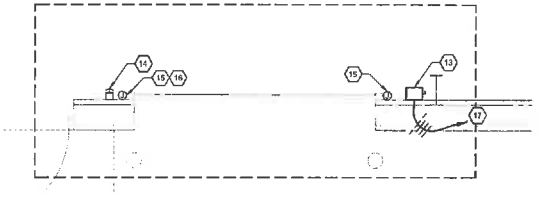
SCALE: 1/4" = 1'-0"

EQUIPMENT SCHEDULE	
ITEM	DESCRIPTION
BR1	ICE MACHINE



3 E-1-400 ENLARGED DOCK POWER PLAN

SCALE: 1/4" = 1'-0"



4 E-1-400 TYPICAL OVERHEAD DOOR POWER PLAN

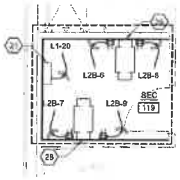
SCALE: 1/2" = 1'-0"

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

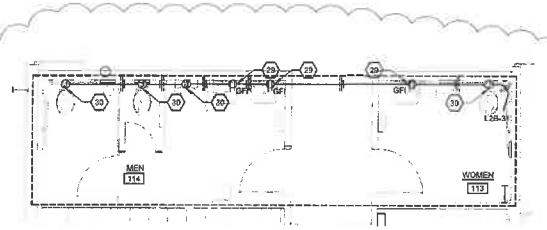
SHEET KEYNOTES:

1. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR AHU.
2. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH EXHAUST FAN.
3. PROVIDE ELECTRICAL CONNECTION TO INTEGRAL DISCONNECT IN ELECTRIC UNIT HEATER.
4. PROVIDE ELECTRICAL CONNECTION FOR GAS FIRED WATER HEATER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
5. PROVIDE ELECTRICAL CONNECTION FOR RECIRULATING PUMP. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
6. REFER TO SHEET E-1-104 FOR CONTINUATION.
7. PROVIDE NEMA 5-20 RECEPTACLE FOR WATER DISPENSER.
8. PROVIDE RECEPTACLE 60" AFF FOR MICROWAVE. COORDINATE EXACT LOCATION WITH CASEWORK.
9. PROVIDE RECEPTACLE 48" AFF. COORDINATE EXACT LOCATION WITH CASEWORK.
10. PROVIDE RECEPTACLE FOR REFRIGERATOR.
11. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
12. PROVIDE NEMA 5-20 RECEPTACLE FOR ICE MAKER.
13. MOTOR RATED SWITCH FOR OVERHEAD DOOR. COORDINATE MOUNTING LOCATION WITH ARCHITECTURAL.
14. UP/DOWN/STOP PUSHBUTTON FOR OVERHEAD DOOR. PROVIDE CONDUIT/WIRING AS REQUIRED TO OVERHEAD DOOR CONTROLLER.
15. CONNECTION TO OVERHEAD DOOR SAFETY BEAM PHOTO SENSOR. PROVIDE CONDUIT/WIRING AS REQUIRED TO OVERHEAD DOOR CONTROLLER.
16. CONNECTION TO OVERHEAD DOOR SENSING EDGE. PROVIDE CONDUIT/WIRING AS REQUIRED TO OVERHEAD DOOR CONTROLLER.
17. OVERHEAD DOOR CIRCUITS:
    - ROOM 123: L2C-1,3,5
    - ROOM 125: L2C-16,18,20
    - ROOM 126: L2D-1,3,5
18. UNDER SINK DISPOSER. PROVIDE WALL SWITCH AND ASSOCIATED WIRING FOR CONTROL OF DISPOSER. COORDINATE LOCATION WITH ARCHITECTURAL CASEWORK.
19. MAIN GROUNDING BAR.
20. PROVIDE 120V CONNECTION TO ACCESS CONTROL PANEL.
21. PROVIDE 120V CONNECTION TO HVAC DDC CONTROL PANEL.
22. PROVIDE SUPPORTS TO STACK TRANSFORMERS.
23. PROVIDE RECEPTACLE FOR DOCK LEVELER. CONNECT TO CIRCUIT L2A-8. PROVIDE 3/4" CONDUIT FROM RECEPTACLE TO WALL MOUNTED PUSH BUTTON.
24. INSTALL PUSH BUTTON FOR DOCK LEVELER 48" AFF.
25. INSTALL CONTROL PANEL FOR VEHICLE RESTRAINT SYSTEM. CONNECT TO CIRCUIT L2A-29. PROVIDE 3/4" CONDUITS TO LIP LIMIT SWITCH AND TRUCK SIGNAL LIGHT.
26. LIP LIMIT SWITCH.
27. TRUCK SIGNAL LIGHT.
28. REFER TO SYSTEMS PANEL ELEVATION FOR DETAILS REQUIREMENTS.
29. PROVIDE RECEPTACLE UNDER SINK FOR AUTOMATIC FAUCET. COORDINATE LOCATION WITH LAVATORY AND FAUCET MANUFACTURERS REQUIREMENTS.
30. PROVIDE CONNECTION TO AUTOMATIC FLUSH VALVES. COORDINATE LOCATION AND CONNECTION TYPE WITH FLUSH VALVE MANUFACTURERS REQUIREMENTS.



5 E-1-400 ENLARGED SECURITY ROOM POWER PLAN

SCALE: 1/4" = 1'-0"



6 E-1-400 ENLARGED PLUMBING CONNECTION POWER PLAN

SCALE: 1/4" = 1'-0"

0' 2' 4' 6' 12'

SCALE: 1" = 4'

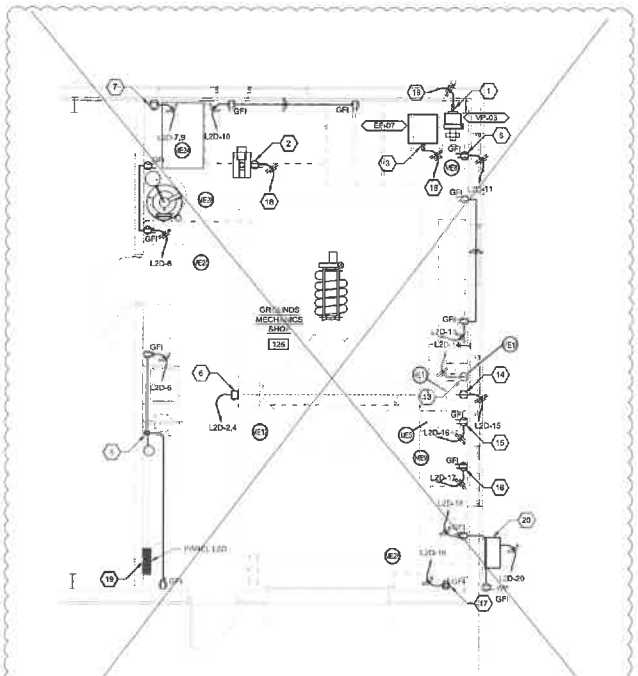
REVISION NUMBER	REVISIONS	DATE	BY
1	SEE REVISIONS	11/05/2021	KGM

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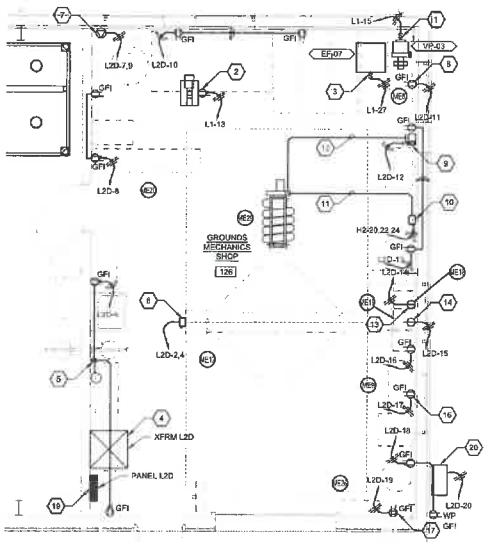
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE / GROUNDS
ENLARGED POWER PLANS

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	E-1-400
REVISION	1



1 E-1-40 **ENLARGED GND MECH SHOP POWER PLAN - PHASE 1A**



2 E-1-401 **ENLARGED GND MECH SHOP POWER PLAN - FINAL**

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-800 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS DEVICES, ETC, WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.
7. COORDINATE EXACT CONNECTION REQUIREMENTS FOR ALL OWNER PROVIDED EQUIPMENT.

SHEET KEYNOTES:

1. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR RADIANT HEATING PUMP.
2. PROVIDE NEMA 5-15 RECEPTACLE FOR RADIANT HEATING BURNER. MOUNT WITHIN 12" OF BURNER UNIT.
3. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH EXHAUST FAN.
4. PROVIDE MOUNTING BRACKET FOR TRANSFORMER. MOUNT TOP OF TRANSFORMER AS CLOSE TO BOTTOM OF STRUCTURE AS POSSIBLE.
5. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
6. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT FURNISHED WITH VEHICLE LIFT.
7. PROVIDE RECEPTACLE FOR AIR COMPRESSOR. PROVIDE AND INSTALL CORD & PLUG FOR OWNER PROVIDED AIR COMPRESSOR.
8. PROVIDE NEMA 5-20 RECEPTACLE FOR DRILL PRESS.
9. LOCATION OF VES FAN START/STOP SWITCH AND HOSE REEL UP/DOWN SWITCH. VES FAN START/STOP SWITCH REQUIRES CONTROL WIRING TO FAN CONTROLLER. HOSE REEL UP/DOWN SWITCH REQUIRES 120V CONNECTION VIA 120V DISCONNECT SWITCH AND POWER/CONTROL TO HOSE REEL.
10. PROVIDE A NEMA 1, 30A NON FUSED DISCONNECT. PROVIDE CONNECTION TO VEHICULAR EXHAUST FAN MOTOR. MOUNT DISCONNECT AND CONTROLLER AT 7'-6" AFF.
11. PROVIDE CONDUIT/WIRING FROM VEHICULAR EXHAUST FAN CONTROLLER TO FAN START/STOP SWITCH.
12. PROVIDE CONDUIT/WIRING FROM HOSE REEL TO UP/DOWN SWITCH.
13. PROVIDE NEMA 5-20 RECEPTACLE 12'-0" AFF FOR OWNER PROVIDED RECEPTACLE CORD REEL.
14. PROVIDE NEMA 5-20 RECEPTACLE 12'-0" AFF FOR OWNER PROVIDED LIGHT CORD REEL.
15. PROVIDE NEMA 5-20 RECEPTACLE FOR WELDER.
16. PROVIDE NEMA 5-20 RECEPTACLE FOR PARTS WASH.
17. PROVIDE NEMA 5-20 RECEPTACLES FOR POWER TOOLS.
18. CIRCUIT SHALL TEMPORARILY BE CONNECTED TO PANEL L2D DURING PHASE 1.
19. PANEL L2D SHALL BE SERVICE ENTRANCE RATED AND TEMPORARILY FED FROM SERVICE DROP POLE DURING PHASE 1. PANEL SHALL BE CONNECTED TO BUILDING SERVICE AFTER THE PHASE 2 BUILDING SERVICE IS OPERATIONAL.
20. OIL WATER SEPARATOR ALARM PANEL.

EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
ME5	MIG WELDER
ME6	DRILL PRESS
ME9	200 PARTS WASH
ME12	GOLF CART LIFT
ME16	POWER REEL
ME17	WORK LIGHT REEL
ME20	TALL WORKBENCH
ME21	TIRE CHANGER
ME24	AIR COMPRESSOR
ME26	PEDISTAL TOOLS
ME28	WATER HEATER
ME29	VEHICLE EXHAUST FAN

SPECIAL NOTE: ADDENDUM #4

ALL REFERENCES TO PHASE 1 INSTALLATION SHALL BE REMOVED FROM THIS PROJECT. ALL WORK SHALL BE INSTALLED IN FINAL BUILDING CONFIGURATION.

0' 2' 4' 8' 12'
SCALE: 1" = 4'

REVISION NUMBER	REVISIONS	DATE	BY
1	SEE REVISIONS	11/03/2021	KGM

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS MECHANICS SHOP
ENLARGED POWER PLAN

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	E-1-401
REVISION	1

PANEL SCHEDULE	L3				VOLTAGE				120/240V, 1-PHASE, 3-WIRE				
LOCATION	BULK STORAGE BLDG				MAINS AMPACITY				100A				
ENCLOSURE	NEMA 3R				MAIN CB SIZE				50A				
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES				28				
AIC RATING	65,000												
DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
LIGHTS - BULK STORAGE	321	1	20A	2#12,1#12G,3/4"C	1	681		2	2#12,1#12G,3/4"C	20A	1	540	RECEPT - BULK STORAGE
LIGHTS - OPEN STORAGE	1284	1	20A	2#12,1#12G,3/4"C	3		2364	4	2#12,1#12G,3/4"C	20A	1	1080	RECEPT - OPEN STORAGE
LIGHTS - OPEN STORAGE	120	1	20A	2#12,1#12G,3/4"C	5	420		6	2#12,1#12G,3/4"C	20A	1	300	LIGHTING CONTROL
FUEL PUMP	660	1	15A	2#12,1#12G,3/4"C	7		1320	8	2#12,1#12G,3/4"C	15A	1	660	FUEL PUMP
SHUNT TRIP					9	0		10					SHUNT TRIP
					11		0	12					
					13	0		14					
					15		0	16					
					17	0		18					
					19		0	20					
					21	0		22					
SPARE		1	20A		23		0	24		20A	1		SPARE
SPARE		1	20A		25	0		26		20A	1		SPARE
SPARE		1	20A		27		0	28		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						1281	3684						
TOTAL AMPERES PER PHASE						10.7	30.7						
**GFI CIRCUIT BREAKER													

PANEL SCHEDULE	L4A				VOLTAGE				208Y/120V, 3-PHASE, 4-WIRE				
LOCATION	MAIL ROOM BLDG - ELECTRICAL 104				MAINS AMPACITY				400A				
ENCLOSURE	NEMA 1				MAIN CB SIZE				400A				
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES				42				
AIC RATING	65,000												
DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RTU-03	12860	3	60A	3#6,1#10G,1"C	1	12980			2	2#12,1#12G,3/4"C	15A	1	180	EF-08
---	12860				3		12800		4					
---	12860				5			14450	6	2#12,1#12G,3/4"C	20A	2	1550	EH-02
WATER HEATER - 103	600	1	20A	2#12,1#12G,3/4"C	7	2250			8				1850	---
PP-3-1 - 103	500	1	20A	2#12,1#12G,3/4"C	9		1060		10	2#12,1#12G,3/4"C	20A	1	500	DDC PANEL - 103
RECEPT - 104	1200	1	20A	2#12,1#12G,3/4"C	11			2400	12	2#12,1#12G,3/4"C	20A	1	1200	RECEPT - 104
ACCESS CONTROL - 104	1000	1	20A	2#12,1#12G,3/4"C	13	2200			14	2#12,1#12G,3/4"C	20A	1	1200	COPIER - 102
RECEPT - 102, 105-107	900	1	20A	2#12,1#12G,3/4"C	15		1400		16	2#12,1#12G,3/4"C	20A	1	500	REFRIGERATOR - 108
MICROWAVE - 108	1200	1	20A	2#12,1#12G,3/4"C	17			1900	18	2#12,1#12G,3/4"C	20A	1	700	DISPOSAL - 108
RECEPT - 108	900	1	20A	2#12,1#12G,3/4"C	19	1620			20	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 108
RECEPT - 109	1080	1	20A	2#12,1#12G,3/4"C	21		1680		22	2#12,1#12G,3/4"C	20A	1	600	COMPUTER - 109
COMPUTER - 109	600	1	20A	2#12,1#12G,3/4"C	23			1200	24	2#12,1#12G,3/4"C	20A	1	600	COMPUTER - 102
COMPUTER - 102	1200	1	20A	2#12,1#12G,3/4"C	25	2100			26	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 102, 110
BIC SAFETY CABINET - 110	1800	1	20A	2#12,1#12G,3/4"C	27		3000		28	2#12,1#12G,3/4"C	20A	1	1200	STRAP MACHINE - 110
PARCEL METERING - 102	1200	1	20A	2#12,1#12G,3/4"C	29			2250	30	2#12,1#12G,3/4"C	20A	1	1050	RECEPT - 101, 102, 110
SPARE		1	20A		31	0			32		20A	1		SPARE
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
Panel L4B	1747	3	200A		37	1747			38		20A	1		SPARE
---	3400				39		3400		40		20A	1		SPARE
---	3726				41			3726	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						22897	23280	25666						
TOTAL AMPERES PER PHASE						190.8	194	216.3						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L4B				VOLTAGE				208Y/120V, 3-PHASE, 4-WIRE				
LOCATION	MAIL ROOM BLDG - ELECTRICAL 104				MAINS AMPACITY				200A				
ENCLOSURE	NEMA 1				MAIN CB SIZE				200A				
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES				42				
AIC RATING	65,000												
DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RECEPT - 102	900	1	20A	2#12,1#12G,3/4"C	1	1440			2	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 102
STAMPING MACHINE - 102	1200	1	20A	2#12,1#12G,3/4"C	3		2400		4	2#12,1#12G,3/4"C	20A	1	1200	STAMPING MACHINE - 102
STAMPING MACHINE - 102	1200	1	20A	2#12,1#12G,3/4"C	5			2346	6	2#12,1#12G,3/4"C	20A	1	1146	LIGHTS
EXT BLDG LTS	144	1	20A	2#12,1#12G,3/4"C	7	307			8	2#12,1#12G,3/4"C	20A	1	163	POLE LIGHTS
FIRE ALARM - 104	500	1	20A	2#12,1#12G,3/4"C	9		1000		10	2#12,1#12G,3/4"C	20A	1	500	FIRE ALARM - 104
LIGHTING CONTACTOR	360	1	20A	2#12,1#12G,3/4"C	11			1380	12	2#12,1#12G,3/4"C	20A	1	1080	RECEPT 102-105
					13	0			14					
					15		0		16					
					17			0	18					
					19	0			20					
					21		0		22					
					23			0	24					
					25	0			26					
					27		0		28					
					29			0	30					
SPARE		1	20A		31	0			32		20A	1		SPARE
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
SPARE		1	20A		37	0			38		20A	1		SPARE
SPARE		1	20A		39		0		40		20A	1		SPARE
SPARE		1	20A		41			0	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						1747	3400	3726						
TOTAL AMPERES PER PHASE						14.6	28.3	31.1						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L5				VOLTAGE				120/240V, 1-PHASE, 3-WIRE				
LOCATION	VEHICLE STORAGE BLDG				MAINS AMPACITY				200A				
ENCLOSURE	NEMA 3R				MAIN CB SIZE				200A				
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES				40				
AIC RATING	65,000												
DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
EH-1A	3750	2	40A	3#6,1#10G,1"C	1	7500		2	3#6,1#10G,1"C	40A	2	3750	EH-1A
---	3750				3		7500	4				3750	---
EH-1A	3750	2	40A	3#6,1#10G,1"C	5	6519		6	3#6,1#10G,1"C	50A	2	2760	AIR COMPRESSOR
---	3750				7		6519	8				2760	---
EF-1A	540	1	15A	2#12,1#12G,3/4"C	9	1276		10	2#12,1#12G,3/4"C	20A	1	630	LIGHTS
RECEPT	360	1	20A	2#12,1#12G,3/4"C	11		720	12	2#12,1#12G,3/4"C	20A	1	360	RECEPT
RECEPT	360	1	20A	2#12,1#12G,3/4"C	13	720		14	2#12,1#12G,3/4"C	20A	1	360	RECEPT
RECEPT	360	1	20A	2#12,1#12G,3/4"C	15		720	16	2#12,1#12G,3/4"C	20A	1	360	RECEPT
RECEPT	360	1	20A	2#12,1#12G,3/4"C	17	720		18	2#12,1#12G,3/4"C	20A	1	360	RECEPT
RECEPT	360	1	20A	2#12,1#12G,3/4"C	19		1360	20	2#12,1#12G,3/4"C	20A	1	1000	FUEL CONTROL PANEL
RECEPT - VEHICLE PARKING	360	1	20A	2#12,1#12G,3/4"C	21	720		22	2#12,1#12G,3/4"C	20A	1	360	RECEPT - VEHICLE PARKING
RECEPT - VEHICLE PARKING	360	1	20A	2#12,1#12G,3/4"C	23		720	24	2#12,1#12G,3/4"C	20A	1	360	RECEPT - VEHICLE PARKING
					25	0		26					
					27		0	28					
					29	0		30					
SPARE		1	20A		31		0	32		20A	1		SPARE
SPARE		1	20A		33	0		34		20A	1		SPARE
SPARE		1	20A		35		0	36		20A	1		SPARE
SPARE		1	20A		37	0		38		20A	1		SPARE
SPARE		1	20A		39		0	40		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						17446	17530						
TOTAL AMPERES PER PHASE						145.4	146.1						
**GFI CIRCUIT BREAKER													

1

REVISION NUMBER	REVISIONS	DATE	BY
1	SEE REVISIONS	11/05/2021	KGM

Chapman Technical Group, a division of Stantec

AIRPORT PLANNING / DEVELOPMENT
ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING

SL Albans, WV (304) 727-5593
Buckhannon, WV (304) 472-8914
www.cheptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL SCHEDULES
PANEL SCHEDULES III

PATRICK JAYE ROGERS — LICENSED PROFESSIONAL ENGINEER — STATE OF WEST VIRGINIA
11/5/21

JOB NUMBER	19027
SCALE	AS NOTED
DATE	AUGUST 6, 2021
DRAWN BY	KGM
DESIGNED BY	KGM
CHECKED BY	PJR
SHEET NO.	E-603
REVISION	1

LIGHT FIXTURE SCHEDULE

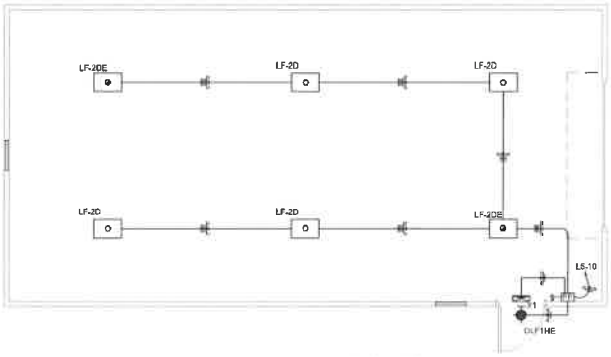
TYPE	DESCRIPTION	COLOR TEMP	LAMP TYPE	LUMENS	WATTS	VOLTAGE	MOUNTING TYPE	MOUNTING HEIGHT	MANUFACTURER	MODEL NUMBER	EQUIVALENT MANUFACTURER
OLF1HE	WALL PACK W/ BATTERY BACKUP & PHOTOCELL	4000K	LED	3,028	24	120	WALL MOUNT	9'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T2S-MVOLT-PE-ELCW	COLUMBIA, EATON OR APPROVED EQUAL

GENERAL NOTES:

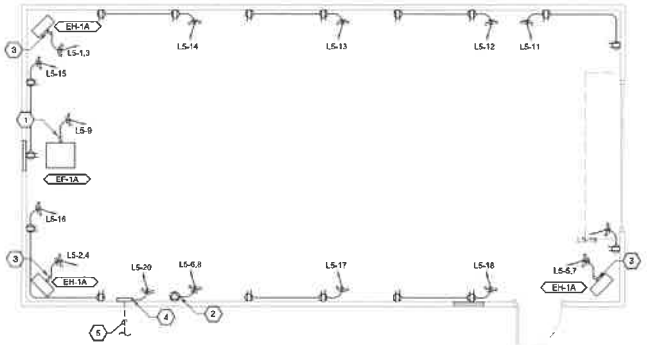
1. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
2. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
3. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
4. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.
5. COORDINATE EXACT CONNECTION REQUIREMENTS FOR ALL OWNER PROVIDED EQUIPMENT.

⬡ SHEET KEYNOTES:

1. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH EXHAUST FAN.
2. PROVIDE RECEPTACLE FOR AIR COMPRESSOR. PROVIDE AND INSTALL CORD & PLUG FOR OWNER PROVIDED AIR COMPRESSOR.
3. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH ELECTRIC HEATER.
4. FUEL TANK CONTROL PANEL.
5. FUEL TANK SIGNAL/CONTROL CONDUITS. PROVIDE TWO (2) 2" CONDUITS FROM BREAKROOM TO FUEL TANKS OUTSIDE OF BUILDING.



1 / E-4-100 **FLOOR PLAN - LIGHTING**
SCALE: 1/4" = 1'-0"



1 / E-4-100 **FLOOR PLAN - POWER**
SCALE: 1/4" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY
1	TEMPORARY SHOP BUILDING	11/05/2021	KGM

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a division of Jacobs
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ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING
St. Albans, WV (304) 727-5501
Buckhannon, WV (304) 472-8514
www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
MAINTENANCE BUILDING
FLOOR PLAN - ELECTRICAL

PATRICK JAYE BAILEY
22794
LICENSED PROFESSIONAL ENGINEER
STATE OF WEST VIRGINIA
11-8-21

JOB NUMBER:	19027
SCALE:	1/4" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	KM
DESIGNED BY:	KM
CHECKED BY:	PB
SHEET NO.	E-4-100
REVISION	1

ADDENDUM ACKNOWLEDGEMENT FORM

SOLICITATION NO.:

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification. Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

- ☐ Addendum No. 1
- ☐ Addendum No. 2
- ☐ Addendum No. 3
- ☐ Addendum No. 4
- ☐ Addendum No. 5
- ☐ Addendum No. 6
- ☐ Addendum No. 7
- ☐ Addendum No. 8
- ☐ Addendum No. 9
- ☐ Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

_____
Company

_____
Authorized Signature

_____
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

	Department of Administration **Purchasing Division** **2019 Washington Street East** **Post Office Box 50130** **Charleston, WV 25305-0130**	**State of West Virginia** **Centralized Request for Quote** **Construction**

Proc Folder: 773207 **Doc Description:** Addendum No. 3 East Campus Metal Buildings Project **Proc Type:** Central Purchase Order			**Reason for Modification:** Addendum No. 3
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2021-10-22	2021-11-30 13:30	CRFQ 0211 GSD2200000014	4

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

State : **Country :** **Zip :**

Principal Contact :

Vendor Contact Phone: **Extension:**

FOR INFORMATION CONTACT THE BUYER
Melissa Pettrey
(304) 558-0094
melissa.k.pettrey@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

SOLICITATION NUMBER: CRFQ 0211 GSD2200000014
Addendum Number: 3

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[✔] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[ ] Attachment of vendor questions and responses

[✔] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[✔] Other

Description of Modification to Solicitation:

Addendum No. 3 is issued to provide the following information to vendors:

1. To revise the Technical Questions submission deadline to Monday, November 8, 2021, by 3:00pm.

2. To revise the Bid Opening Date and Time to Tuesday, November 30, 2021, at 1:30pm.

3. To provide a copy of the Mandatory Pre-Bid Meeting Sign In Sheet, per Attachment A
4. To make miscellaneous revisions to several Division 0 & 1 Specifications sections in the Project Manual, per Attachment A.
5. To make miscellaneous revisions to the General Construction Specifications section of the Centralized Request for Quotations, per Attachment A. No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A
(See Attached)

Pre-Bid Sign-In Sheet

Solicitation Number: CRFQ GSD2200000014
Date of Pre-Bid Meeting: 10/19/2021
Location of Prebid Meeting: Bldg. 7 Capital Rm.

Please Note:
Vendors must sign-in on this sheet to verify attendance at the Pre-Bid meeting.
Failure to legibly sign in may be grounds for declaring a vendor ineligible to bid.
For further verification, please also provide a business card if possible.

Firm Represented:*	Rep Name (Printed):	Firm Address:	Telephone #:	Fax #:	Email:
Wolf Creek Contracting	BJ Scott	405 Waterford Rd Waterford OH 45786	740-749-5826	740-422-1244	Estimating@wolfcreekcontractors.com
BBL Carlton	Tom Simms	600 Kanawha Blvd. East Suite 200 Charleston, WV 25301	304-345-1300	304-345-1366	tsimms@bblcarlton.com
Foster	Mark Stolle	Scott Depot WV	304.206.7808		mark@fostersupply.com
Ayala Construction Co. Inc	Austin King	1700 WV-34 Hurricane, WV 25526	304.542.153?	304.343.0063	AKing@AyalaConstructionCo.com
Danhill Const. Co.	Chris Dozier	P.O. Box 685 Gauley Bridge, W.V. 25085	304 632-1600	304 632-1501	cdozier33@yahoo.com
Maryland C. Smith Construction Co, Inc	John Strickland	PO Box 11882 Charleston, WV 25339	304 549-0326	304 925-3228	ESTIMATING@MCSCONSTRUCTION.com

***One Vendor Per Representative** - No one individual is permitted to represent more than one vendor at the pre-bid meeting. Any individual that does attempt to represent two or more vendors will be required to select one vendor to which the individual's attendance will be attributed. The vendors not selected will be deemed to have not attended the pre-bid meeting unless another individual attended on their behalf.*

Pre-Bid Sign-In Sheet

Solicitation Number: CRFQ GSD2200000014
Date of Pre-Bid Meeting: 10/19/2021
Location of Prebid Meeting: Bldg. 7 Capital Rm.

Please Note:
Vendors must sign-in on this sheet to verify attendance at the Pre-Bid meeting.
Failure to legibly sign in may be grounds for declaring a vendor ineligible to bid.
For further verification, please also provide a business card if possible.

Firm Represented:*	Rep Name (Printed):	Firm Address:	Telephone #:	Fax #:	Email:
SQP Construction	Scott Cunningham	281 Smiley Dr. St. Albans, WV 25177	304-532 3659	N/A	estimating@sqpgc.com
DSO Mechanical	Mike Laughlin	515 Third Ave So. Charleston, WV 25303	304-744-8479	304-744-8491	mlaughlin@dsomech.com
Persinger + Associates	Amanda Gianola	1509 Hansford St. Charleston, WV 25311	304.344 5200	304.344. 5222	amanda@persingerandassociates.com
Swope Construction	James Pennington	1325 Bluefield Ave Bluefield, WV	304-525 9958	—	Bid@swopeco.com

James B. Pennington
Project Manager

swope

100 Price Industrial Lane
Huntington, WV 25705
Office: 304-525-9958
Cell: 606-615-2321
Bluefield Fax: 304-327-9444
Web: www.swopeco.com
Email: jpennington@swopeco.com

is permitted to represent more than one vendor at the pre-bid meeting. Any individual that does
red to select one vendor to which the individual's attendance will be attributed. The vendors not
d meeting unless another individual attended on their behalf.

CRFQ GSD2200000014
Addendum #3 ATTACHMENT A

Note: The deadline for submitting Technical Questions and the Bid Opening Date are both postponed by this Addendum in order for the Agency to revise specifications and contract conditions to revise the requirement that the existing Mechanics Shop be preserved during construction. By subsequent Addendum, specifications and drawings will be added and/or revised to reflect this change. All technical questions submitted by the revised deadline will also be answered by subsequent Addendum.

Revisions to Divisions 0 and 1 in the Project Manual:

1. **AIA A101 Agreement:** Delete any reference to the AIA A101 Agreement in the Project Manual, Division 0 ("Part 1") TABLE OF CONTENTS. Also, please remove the sample A101 Agreement, including its Additions and Deletions Report and the AIA D401 Certificate of Authenticity, from the Project Manual. The document will not be used to execute a Contract award for this solicitation.

2. **Division 1, Section 012500, Substitutions Procedures (Post Award):** Revise the title of Section 012500 in the TABLE OF CONTENTS to read "Substitution Procedures (Post Award." Also, revise the Section's contents in the Project Manual as follows:

   a. Revise all headers and footers to read "Substitution Procedures (Post Award)
   b. Revise Item 1.2.A.3.a by removing "Addendum" as a form of acceptance.
   c. Revise Item 1.6.B. to read: "Substitutions for Convenience of Contractor: Not allowed **unless otherwise indicated."**
   d. Revise Item 1.6.C. to read: "Substitutions for Convenience **of Owner**: Architect will consider requests for substitution if received within **Sixty (60) days after award of the contract**. Requests received after that time may be considered or rejected at discretion of Architect."

   This revision does not modify the Centralized Request for Quotation General Conditions, Item 13, Substitutions, which concerns only substitution requests submitted prior to the technical questions deadline.

3. **Division 1, Section 013300, Submittal Procedures:** Revise Item 1.4.A.2. by adding this sentence to the end of the paragraph: **"Note: the submittal for metal buildings must be submitted within Twenty-One (21) calendar days after the award of the Contract, regardless of other requirements of this section."**

CRFQ GSD2200000014
Addendum #3 ATTACHMENT A

Revisions to the General Construction Specifications:

1. **Pricing Page Requirement:** Under Section 5, CONTRACT AWARD, of the General Construction Specifications, add:

   5.1 Pricing Page: Vendor SHALL submit a copy of the Exhibit A, Pricing Page, with their Bid. Vendor should complete the Pricing Page in full as failure to complete the Pricing Page in its entirety may result in Vendor's bid being disqualified. Vendor should provide a Bid for all Alternate Bid Items; failure to do so may result in Vendor's bid being disqualified.

2. **Project Plans:** Under Section 12, PROJECT PLANS, of the General Construction Specifications, add:

   12.1 Architect will provide the awarded Vendor with a complete, construction set of Project Plans which will incorporate all modifications made to the Project Plans by Addendum during the Bid Phase.

	Department of Administration **Purchasing Division** **2019 Washington Street East** **Post Office Box 50130** **Charleston, WV 25305-0130**	**State of West Virginia** **Centralized Request for Quote** **Construction**

Proc Folder: 773207 **Doc Description:** Addendum No.2 East Campus Metal Buildings Project **Proc Type:** Central Purchase Order			**Reason for Modification:** Addendum No. 2
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2021-10-15	2021-11-16 13:30	CRFQ 0211 GSD2200000014	3

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

State : **Country :** **Zip :**

Principal Contact :

Vendor Contact Phone: **Extension:**

FOR INFORMATION CONTACT THE BUYER
Melissa Pettrey
(304) 558-0094
melissa.k.pettrey@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

SOLICITATION NUMBER: CRFQ 0211 GSD2200000014
Addendum Number: 2

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[ ] Modify bid opening date and time

[✔] Modify specifications of product or service being sought

[ ] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[ ] Other

Description of Modification to Solicitation:

Addendum No. 2 is issued to revise the allowable Fixed Period for Final Completion of the entire project, and to modify the allowable time for achieving Substantial Completion of the construction phases, per Attachment A.

No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A
(See Attached)

CRFQ 0211 GSD2200000014
Addendum #2 ATTACHMENT A

General Conditions Modification:

In the General Conditions section of the Centralized Request for Quotation (CRFQ), in the section labeled "CONTRACT TERM; RENEWAL; EXTENSION," revise the Fixed Period Contract item to read:

"Fixed Period Contract: This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within Seven Hundred and Eighty (780) days."

General Construction Specifications Modifications:

In the General Construction Specifications section of the CRFQ, in Item 10. SUBSTANTIAL AND FINAL COMPLETION, revise to read:

"Vendor shall achieve substantial completion, by Phase, as indicated below, with the stated number of calendar days after the Contract start date established by the issuance of the Notice to Proceed. See Drawing G-003, Alternates and Phasing Plan. Failure to meet the deadlines established herein, unless extended by change order authorizing additional time free of liquidated damages, will result in liquidated damages being applied:

Phase A (1, 2 & 3): Substantially Complete within **Four Hundred and Eighty (480)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase B (1 & 2): Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase C1: If awarded as Alternate #1, Substantially Complete within **Five Hundred and Forty (540)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase C2: Phase C2 may not begin until Phase C1 has been Substantially Completed and the personnel and equipment of the WV Office of Technology is moved into the new Mailroom, but otherwise must be Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase D: If awarded as Alternate #2, Phase D may not begin until Phase C2 has at least begun, but otherwise must be Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Phase E: If awarded as Alternate #3, Phase E must be Substantially Complete within **Seven Hundred and Fifty (750)** calendar days after the start date established by the issuance of the Notice to Proceed.

Final Completion: For each of the aforementioned Phases, Final Completion is to be achieved no later than Thirty (30) calendar days after Substantial Completion."

ADDENDUM ACKNOWLEDGEMENT FORM

SOLICITATION NO.: CRFQ GSD2200000014

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification. Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

- ☑ Addendum No. 1
- ☑ Addendum No. 2
- ☑ Addendum No. 3
- ☑ Addendum No. 4
- ☑ Addendum No. 5
- ☑ Addendum No. 6
- ☑ Addendum No. 7
- ☑ Addendum No. 8
- ☑ Addendum No. 9
- ☑ Addendum No. 10
- ☑ Addendum No. 11

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

SQP Construction Group Inc.

Company

, President

Authorized Signature

March 1, 2022

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

WV State Capitol
East Campus Project

THE OWNER:
(Name, legal status and address)

WV General Services Division
112 California Avenue, Fifth Floor
Charleston, WV 25305

THE ARCHITECT:
(Name, legal status and address)

Chapman Technical Group
200 Sixth Avenue
Saint Albans, WV 25177

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

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9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

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Init.
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User Notes: (2018194789)

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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User Notes:
(1314219830)

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

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§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

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§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

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delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely

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upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

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§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

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ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

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§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

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.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

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§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

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§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

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promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or

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expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

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§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance
The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss
§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work
§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work
§ 12.2.1 Before Substantial Completion
The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion
§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during

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that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

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§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

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§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

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.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

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§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

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§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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User Notes:

State of West Virginia

Supplementary Conditions to AIA Document A201-2017
General Conditions of the Contract for Construction

The following Supplementary Conditions modify the General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

Order of Precedence: The documents contained in the contract to which this document has been attached shall be interpreted in the following order of precedence:

First Priority – Documents developed by the State or agency and utilized to provide public notice of the solicitation, along with other general terms and conditions shall be first in priority.

Second Priority – This document "Supplementary Conditions to the AIA Document A201-2017 General Conditions of the Contract for Construction" shall be second in priority.

Third Priority – all other AIA documents including, but not limited to, the AIA Document A201-2017 General Conditions of the Contract for Construction and the A101-2017 Standard Form of Agreement Between Owner and Contractor (when utilized) shall be third or lower in priority.

ARTICLE 1
GENERAL PROVISIONS

Add the following Section to Article 1:

§1.05 PARTY RELATIONS

§1.05 The Owner and their consultants, the Architect and their Consultants, and the Contractor and their Subcontractors agree to proceed with the Work on the basis of mutual trust, good faith and fair dealing.

§1.1 BASIC DEFINITIONS

§1.1.1 THE CONTRACT DOCUMENTS

§1.1.1 Delete the last sentence of this Section and substitute the following:

The Contract Documents also include the Bidding Documents (Advertisement or Invitation to Bid, Request for Quotations/Bids, Instructions to Bidders, Form of Proposal, Bid Bond and Sample Forms), Performance Bond, Payment Bond, Maintenance Bond (if applicable), Certificates of Insurance, Special Provisions For Disadvantaged and Women Business Enterprise Utilization (if bound herein).

§1.1.2 THE CONTRACT

§1.1.2 Make the following changes to Section 1.1.2:

In the last sentence, insert "and the Contractor" after "The Architect" and delete "the Architect's" and insert "their respective".

§1.2 Correlation and Intent of Contract Documents

§1.2.1.1 In the second sentence, remove "any law" and insert "West Virginia law or any applicable federal law". In the last sentence, remove "by law" and insert "West Virginia law or any applicable federal law".

§1.7 Digital Data Use and Transmission

§1.7 Delete the last sentence of this section in its entirety.

§1.8 Building Information Models Use and Reliance

§ 1.8 Remove this section in its entirety and replace it with the following:

"Any use of, or reliance on, all or a portion of a building information model must be approved in advance by Owner and will only be permitted if the Parties have agreed upon and executed written documents to memorialize protocols governing the use of, and reliance on, the information contained in the model."

ARTICLE 2
OWNER

§2.1 GENERAL

§ 2.1.1 Add the following after the last sentence:

Notwithstanding the foregoing, the parties understand that since Owner is a government entity, change orders will often require approval by entities in addition to owner. When owner is a state agency, those entities may include, but are not limited to, the West Virginia Attorney General's Office and the West Virginia Purchasing Division. Additionally, approval may be required by agencies providing project funding, including but not limited to, West Virginia School Building Authority and agencies of the United States federal government.

§2.1.2 Delete Section 2.1.2 in its entirety.

§2.1 Add the following Section to 2.1:

§2.1.3 The Owner and the agency funding the project reserve the right to maintain a full time or part time project representative (sometimes referred to as the "Clerk of the Works") at the project site who shall keep the Owner informed of the progress and quality of the Work and responsibilities. The Contractor shall cooperate and assist the Clerk of the Works in the performance of his/her duties. The Clerk of the Works will not interfere with or be responsible for the Contractor's supervision and direction of the Work, and the Contractor's means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work. The Clerk of the Works may facilitate communications between the Owner, Architect, and Contractor but has no authority to make decisions for the Owner, approve modifications to the Contract Documents, the Contract Time, or Contract Sum. Additionally, Contractor is not permitted to rely on or consider decisions made by the Clerk of the Works on behalf of Owner

§2.2 Evidence of the Owner's Financial Arrangements: Delete § 2.2 and all of its subsections in its entirety.

§2.3 Information and Services Required of Owner

§2.3.2 Make the following changes to Section 2.3.2:

In first sentence, delete the period and add ", when required pursuant to West Virginia Code §30-12-1 et seq." Add the following sentence at the end of Section 2.3.2: "If the Owner does not retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located, the Owner will appoint an individual to assume the role and obligations of the Architect pursuant to this Agreement."

§2.3.3 Delete this section in its entirety.

§2.3.4 Delete the last sentence of Section 2.3.4 and substitute the following:

The Contractor shall confirm the locations of each utility. If the Owner has provided geotechnical and other tests to determine subsurface conditions, the Owner will provide such documents to the Contractor; the Contractor acknowledges that it will make no claims for any subsurface or any other conditions revealed by these tests.

ARTICLE 3
CONTRACTOR

§3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§3.2.2 Add the following sentence to the end of Section 3.2.2:

Claims by Contractor resulting from its failure to familiarize itself with the site shall be deemed waived. Additionally, by submitting a bid or otherwise entering into this contract, Contractor acknowledges that it has reviewed and understands the contract documents and the work required by those documents. Any claims arising from Contractor's failure to review and understand the contract documents shall be deemed waived.

§3.2.3 Delete Section 3.2.3 in its entirety and substitute the following:

§3.2.3 The Contractor acknowledges its continuing duty to review and evaluate the Construction Documents during performance of its services and shall immediately notify the Owner and the Architect about any problems, conflicts, defects, deficiencies, inconsistencies or omissions it discovers in or between the Construction Documents; and variances it discovers between the Construction Documents and applicable laws, statutes, building codes, rules and regulations.

§ 3.2.4 Add the following clauses to Section 3.2.4:

§3.2.4.1 If the Contractor performs any Work which it knows or should have known involves a recognized problem, conflict, defect, deficiency, inconsistency or omission in the Construction Documents; or a variance between the Construction Documents and requirements of applicable laws, statutes, building codes, rules and regulations, without notifying the Owner and the Architect prior to receiving written authorization from the Architect to proceed, the Contractor shall be responsible for the consequences of such performance.

§3.2.4.2 Before ordering any materials or doing any Work, the Contractor and Subcontractors shall verify all measurements at the site and shall be responsible for the correctness of same. Discrepancies shall be reported in writing to the Architect prior to proceeding with the Work. No extra charge or compensation will be

entertained due to differences between actual measurements and dimensions indicated on the drawings, if such differences do not result in a change in the scope of Work or if the Architect failed to receive written notice before the Work was performed.

§3.4 LABOR AND MATERIALS

§3.4.1 Vendor must review and comply with the following statutory requirements affecting public construction projects, as well as any other applicable laws that are not referenced herein:

- W. Va. Code § 5-19-1 et seq., relating to domestic steel preference.
- W. Va. Code § 5A-3-56 relating to domestic steel preference, provided that the Owner is a state agency subject to Chapter 5A, Article 3 of the W. Va. Code.
- W. Va. Code § §21-1C-1 *et seq.*, relating to local hiring preference
- W. Va. Code §21-1D-1 *et seq.*, relating to drug free workplace requirements.

§3.4 Add the following Sections to 3.4:

§3.4.4 Where materials and equipment are to be provided by the Owner under the Contract Documents, the Contractor shall notify the Owner in writing as to when materials and equipment are required on the project site in sufficient time to avoid delay in the Work.

§3.4.5 The Contractor shall employ labor on the Project or in connection with the Work, capable of working harmoniously with all trade crafts and any other individuals associated with the Project. The Contractor shall also use its best efforts and implement policies and practices to minimize the likelihood of any strike, work stoppage or other labor disturbance. Except as specifically provided in this Agreement, Contractor shall not be entitled to any adjustment in the Contract sum or Contract time and shall be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes by the work force of or provided by Contractor or its Subcontractors.

§3.5 WARRANTY

§3.5 Add the following sentence at the end of Section 3.5:

The Contractor agrees to assign to the Owner at time of Final Completion of the Work, any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such a manner so as to preserve any and all such warranties.

§3.8 ALLOWANCES

§3.8.3 Make the following change to Section 3.8.3:

§3.8.3 Delete "with reasonable promptness" and insert "in sufficient time to avoid delay in the Work."

Add the following Section to 3.8:

§3.8.4 The Contractor shall promptly submit to the Owner an itemized account of any expenditure by the Contractor of the Contract allowance in sufficient detail to allow the Owner to properly account for such expenditure.

§3.9 SUPERINTENDENT/PROJECT MANAGER

§3.9.1 Add the following sentence to the end of Section 3.9.1:

The Contractor may also employ a competent project manager.

§3.9.2 Make the following changes to Section 3.9.2:

In the first sentence, add "and project manager, if applicable" after "superintendent." In the second sentence, add "or project manager, if applicable," after "superintendent."

§3.9.3 Make the following changes to Section 3.9.3:

In the first sentence, add "or project manager, if applicable," after "superintendent." In the second sentence, add "or project manager, if applicable," after "superintendent."

§3.9 Add the following Section to 3.9:

§3.9.4 The Owner shall have the right, at any time, to direct a change in the Contractor's representatives if their performance is deemed unsatisfactory.

§3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§3.10.1 Make the following changes to Section 3.10.1:

In the first sentence, delete the word "promptly" and substitute "by the earliest reasonable date".

Add the following sentence to the end of Section 3.10.1: "The Contractor shall submit an updated construction schedule with each payment application, unless waived by the Owner."

Add the following Sections to 3.10:

§3.10.4 At any time after the first thirty (30) days of the Contract Time, if it is found that the project is two (2) weeks or more behind schedule, beyond approved time extensions, or if at any time during

the last thirty (30) days of the scheduled Contract Time the Contractor is one (1) week or more behind schedule, the Contractor shall immediately submit a plan to the Owner describing how the Work will be placed back on schedule within the remaining Contract Time.

§3.10.5 If the Owner and the Architect determine that the performance of the Work during any stage of the construction schedule last approved by the Owner has not progressed or reached the level of completion required by the Contract Documents, the Owner will have the right to order the Contractor to take corrective measures (hereinafter referred to collectively as Extraordinary Measures) necessary to expedite the progress of the Work, including, without limitation: (1) working additional shifts or overtime; (2) supplying additional manpower, equipment and facilities; and (3) other similar measures. Such Extraordinary Measures shall continue until the progress of the Work complies with the last approved construction schedule. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule after allowing for approved extensions of Contract Time as provided elsewhere in this Agreement. The Contractor is not entitled to an adjustment in the Contract Sum in connection with any Extraordinary Measures required by the Owner. The Owner may exercise its rights under this Section as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with the construction schedule.

§3.11 DOCUMENTS AND SAMPLES AT THE SITE

§3.11 Insert the following sentence at the end of Section 3.11:

The Contractor's compliance with this Section 3.11 shall be a condition precedent to any obligation of the Owner to make Final Payment pursuant to this Agreement.

§3.15 CLEANING UP

§3.15.2 Delete Section 3.15.2 in its entirety and substitute the following:

§3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and may withhold such reasonable costs as necessary for the fulfillment of the Contractor's obligation under this Section 3.15. If the reasonable costs of such cleaning exceed the Contract Sum then due the Contractor, the Contractor shall reimburse the Owner the difference within thirty (30) consecutive calendar days of the Owner's written request.

Any materials, tools, supplies, or other personal property left by the Contractor shall be deemed abandoned property and the Owner shall have no obligation to hold or store the property on behalf of Contractor and may dispose of the abandoned property as if it were property of the State of West Virginia. Provided however, that prior to treating property as abandoned and disposing of it, Owner must first provide Contractor with 10 days notice of its intent to do so. If any materials, tools, supplies or other personal property belong to a subcontractor, then Contractor is obligated to communicate this notice to its subcontractor immediately.

§3.15 Add the following Section to 3.15:

§3.15.3 In order to achieve Substantial Completion, as defined by Section 9.8, for any portion of the Work, the Contractor must have the area where the Work is located fully cleaned and all materials and/or debris removed from site. The Certificate of Substantial Completion will not be issued until the Contractor has met this obligation.

ARTICLE 4
ARCHITECT

§4.1 GENERAL

§4.2 ADMINISTRATION OF THE CONTRACT

§4.2 Make the following changes to Section 4.2:

§4.2.1 In the first sentence of Section 4.2.1 after the word Architect add ", unless otherwise indicated by the Owner,".

§4.2.2 In the first sentence of Section 4.2.2 strike the word "generally."

§4.2.3 In the first sentence of Section 4.2.3 strike the word "reasonably."

§4.2.5 Add the following sentence at the end of Section 4.2.5:

The Architect upon receipt of an Application for Payment from the Contractor shall either review and certify such amounts due for payment or return such Application for Payment to the Contractor for correction(s) within five (5) consecutive business days of receipt.

§4.2.7 Delete the first sentence of Section 4.2.7 and substitute the following:

The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Modify the second to last sentence by removing it in its entirety and replacing it with the following: The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures, unless the Architect has established the required construction means, methods, techniques, sequences, or procedures, or the Contract Documents require such approval.

§4.2.8 Make the following change to Section 4.2.8:

In the first sentence, after the word Architect add ", in consultation with the Owner,".

ARTICLE 5
SUBCONTRACTORS

§5.2 Award of Subcontracts and Other Contracts for Portions of Work

§5.2.1 Add the following sentence to Section 5.2.1.

This provision in no way limits the Contractor's legal obligations to report subcontractors and labor/material suppliers under W. Va. Code § 5-22-1(f) and obtain approval under W. Va. Code § 5-22-1(g) prior to any subcontractor substitution.

§5.4 Contingent Assignment of Subcontracts: This section is removed in its entirety and replaced with the following:

§5.4 Emergency Contracts with Subcontractors:

In the event that the general contractor fails to fulfill its contractual obligations and the performance bond has failed to provide an adequate remedy, Owner has the right to execute emergency contracts with subcontractors to ensure continuation of the work, provided that doing so is in compliance with the laws, rules, and procedures governing emergency contracting authority for Owner, and the emergency contract terms comply with all other applicable laws, rules, and procedures.

ARTICLE 7
CHANGES IN THE WORK

§7.1 General

§7.1.2. In Section 7.1.2. remove the word "alone" and insert "with approval by the Owner."

§7.2 CHANGE ORDERS

§7.2 Add the following Section to 7.2:

§7.2.2 A written Change Order as defined under 7.2.1 above constitutes a final settlement of all matters relating to the change in the Work which is the subject of the Change Order, including, but not limited to general conditions, all direct or indirect costs associated with such change and any and all adjustment to the Contract Sum and Contract Time. The parties also understand and agree that if Owner is a state agency, change orders may require approval by entities in addition to Owner. Those entities may include, but are not limited to, the West Virginia Purchasing Division, and the West Virginia Attorney General's Office. Owner and Contractor must discuss the change order approval requirements prior to executing this agreement.

Add the following section to § 7.2

§7.2.3. Allowance for Overhead and Profit: Contractor's overhead and profit for a change order issued under this Article included in the total cost to the Owner shall not exceed based on the following schedule:

.1 For the Contractor, for any Work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

.2 For the Contractor, for Work performed by the Contractor's Subcontractor, ten percent (10%) of the amount due the Subcontractor.

.3 For each Subcontractor or Sub-Subcontractor involved, for any Work performed by that Subcontractor's own forces, fifteen percent (15%) of the cost.

.4. For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, ten percent (10%) of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7. Estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Change Order work. Supervision above the level of working foremen (such as general foremen, superintendent, project manager, etc.) is considered to be included in the allowance for Overhead and Profit. Hand tools are defined as equipment with a value of $1,000 or less. For Contractor owned equipment, the "bare" equipment rental rates allowed to be used for pricing Change Order proposals shall be not more than the monthly rate listed in the most current publication of The AED Green Book divided by 176 to arrive at a maximum hourly rate to be applied to the hours the equipment is used performing the Change Order work.

.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, material, equipment and Subcontractors. Details to be submitted will include detailed line item estimates showing detailed materials quantity take-offs, material prices by item and related labor hour pricing information and extensions (by line item or by drawing as applicable.) Where major cost items are Subcontracts, they shall also be itemized as prescribed above. In no case will a change involving over $10,000 be approved without such an itemization.

.7 Local Business and Occupation Taxes, if applicable, shall be calculated on the cost of the Work, overhead and profit..

.8 Overhead and profit shall not be calculated on changes in the Work involving unit prices. Unit prices are to have overhead and profit included in the price quoted.

.9 Under no circumstances is Contractor permitted to charge for the passage of time (often referred to as general conditions or winter conditions) without an identified, itemized, and concretely provable cost borne by Contractor. Contractor has a duty to mitigate costs during a delay period to the fullest extent possible and Contractor will not be paid for costs that could have been mitigated. Calculating a daily delay rate without properly identifying, itemizing, and proving actual, unmitigateable costs, is prohibited. Contractor understands and accepts that it has the responsibility to prove that costs could not be mitigated prior to submitting a request for payment.

§7.3 CONSTRUCTION CHANGE DIRECTIVES

§7.3.4 Make the following change in Section 7.3.4:

In the fourth line of the first sentence, delete the words "an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount" and substitute "an allowance for overhead and profit in accordance with clauses 7.3.11.1 through 7.3.11.9 below."

§7.3.7 Delete the word "recorded" and replace it with "processed".

§7.3.9 Delete Section 7.3.9 in its entirety and substitute the following:

§7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment provided these amounts have been added to the Contract by Change Order and a purchase order has been issued for the Change Order.

§7.3.10 Add the following sentence to the end of Section 7.3.10:

The Parties will utilize their best efforts to issue a change order within 60 days of agreement being reached, but failure to do so will not give rise to grounds for contract cancellation, penalties, or any other cause of action.

Add the following Section to 7.3:

§7.3.11 In Section 7.3.7, the allowance for overhead and profit for a change directive issued under this Article included in the total cost to the Owner shall not exceed the following schedule:

.1 For the Contractor, for any Work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

.2 For the Contractor, for Work performed by the Contractor's Subcontractor, ten percent (10%) of the amount due the Subcontractor.

.3 For each Subcontractor or Sub-Subcontractor involved, for any Work performed by that Subcontractor's own forces, fifteen percent (15%) of the cost.

.4. For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, ten percent (10%) of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7. Estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Change Order work. Supervision above the level of working foremen (such as general foremen, superintendent, project manager, etc.) is considered to be included in the allowance for Overhead and Profit. Hand tools are defined as equipment with a value of $1,000 or less. For Contractor owned equipment, the "bare" equipment rental rates allowed to be used for pricing Change Order proposals shall be not more than the monthly rate listed in the most current publication of The AED Green Book divided by 176 to arrive at a maximum hourly rate to be applied to the hours the equipment is used performing the Change Order work.

.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, material, equipment and Subcontractors. Details to be submitted will include detailed line item estimates showing detailed materials quantity take-offs, material prices by item and related labor hour pricing information and extensions (by line item or by drawing as applicable.) Where major cost items are Subcontracts, they shall also be itemized as prescribed above. In no case will a change involving over $10,000 be approved without such an itemization.

.7 Local Business and Occupation Taxes, if applicable, shall be calculated on the cost of the Work, overhead and profit.

.8 Overhead and profit shall not be calculated on changes in the Work involving unit prices. Unit prices are to have overhead and profit included in the price quoted.

.9 Under no circumstances is Contractor permitted to charge for the passage of time (often referred to as general conditions or winter conditions) without an identified, itemized, and concretely provable cost borne by Contractor. Contractor has a duty to mitigate costs during a delay period to the fullest extent possible and Contractor will not be paid for costs that could have been mitigated. Calculating a daily delay rate

without properly identifying, itemizing, and proving actual, unmitigateable costs, is prohibited. Contractor understands and accepts that it has the responsibility to prove that costs could not be mitigated prior to submitting a request for payment.

§7.4 Minor Changes in Work. Insert the following sentence at the end of section 7.4:

"Contractor may request that Architect provide written confirmation that Owner has agreed to the minor change, and if requested, Architect will provide it."

ARTICLE 8
TIME

§8.3 DELAYS AND EXTENSIONS OF TIME

§8.3.1 In the first sentence, delete "unusual delay in deliveries," and add "unmitigatable costs attributable to" before the words "adverse weather conditions."

ARTICLE 9
PAYMENTS AND COMPLETION

§9.1 Contract Sum

§9.1.2 Add the following sentence to the end of section 9.1.2:

"Any equitable adjustment of unit prices must be processed as a change order to the contract"

§9.2 SCHEDULE OF VALUES

§9.2 Make the following changes to Section 9.2:

In the first sentence add "and the Owner" after the first reference to the Architect. In the second sentence add "or the Owner" after Architect. Remove the last sentence in its entirety and replace it with the following:

"Any changes to the schedule of values shall be submitted to the Architect and the Owner and supported by such data to substantiate its accuracy as the Architect or owner may require. This schedule, unless objected to by the Architect or the Owner, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment."

§9.3 APPLICATIONS FOR PAYMENT

§9.3 Make the following changes to Section 9.3:

§9.3.1 In the first sentence add "and the Owner" after the first reference to the Architect and add "and other required documents" after the words "schedule of values."

§9.3.1.1 Delete clause 9.3.1.1 in its entirety and substitute the following:

§9.3.1.1 Such applications may include requests for payment on account of changes in the Work authorized by Construction Change Directives and Change Orders only after a purchase order has been issued for the Work affected.

§9.3.1 Add the following clauses to Section 9.3.1:

§9.3.1.3 Until the Work is fifty percent (50%) complete, the Owner will withhold as retainage 10% of the amount due the Contractor on account of progress payments. At the time the Work is fifty percent (50%) complete and thereafter, if the manner of completion of the Work and its progress are and remain satisfactory to the Owner and Architect, and in the absence of other good and sufficient reasons, the Architect will, on presentation by the Contractor of Consent of Surety, authorize any remaining partial payments to be paid in full.

§9.3.1.4 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Owner and Architect, if the Surety withholds its consent, or for other good and sufficient reasons.

§9.4 CERTIFICATES FOR PAYMENT

§9.4.1 After the phrase "in the full amount of the Application for Payment," insert the phrase "less any retainage withheld pursuant to section 9.3.1.3,".

§9.6 PROGRESS PAYMENTS

§9.6.7 Delete Section 9.6.7 in its entirety.

§9.6.8 Delete Section 9.6.8 in its entirety.

§9.7 FAILURE OF PAYMENT

§9.7 Make the following changes in Section 9.7:

In line two, change "seven days" to "sixty days." In line four, delete "binding dispute resolution" and substitute "the West Virginia Claims Commission"

§9.8 SUBSTANTIAL COMPLETION

§9.8.3 Add the following clause to Section 9.8.3:

If Architect is required to perform more than one inspection under this subsection, Contractor shall be responsible for paying the Owner for the cost of the additional inspection, which will be paid by Owner to Architect, at the hourly rate established in the contract between Owner and Architect.

§9.8.5 Add the following clause to Section 9.8.5:

§9.8.5.1 The payment of retainage shall be sufficient to increase the total payments to ninety-five percent (95%) for the Work or designated portion thereof being accepted as Substantially Complete, less any amounts as the Architect shall determine for any Work that is not complete, not in accordance with the Contract Documents, or for unsettled claims.

§9.10 FINAL COMPLETION AND FINAL PAYMENT

§9.10.1 Add the following to the end of Section 9.10.1:

If Architect is required to perform more than one inspection under this subsection, Contractor shall be responsible for paying the Owner for the cost of the additional inspection, which will be paid by Owner to Architect, at the hourly rate established in the contract between Owner and Architect.

§9.10.2 Make the following changes in Section 9.10.2:

In the first sentence, delete "for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner)."

Add the following clause to Section 9.10.2:

§9.10.2.1 Before final payment is due the Contractor, all applicable State and local taxes must be paid. If requested by the Owner, the Contractor shall present evidence that payment or satisfaction of all such tax obligations has been made.

§9.10.3 Add the following clause to Section 9.10.3:

9.10.3.1 Unless and to the extent final completion is delayed through no fault of the Contractor as provided in Section 9.10.3, the Owner shall be under no obligation to increase payments above ninety-five percent (95%) until final completion of the Work is Certified by the Architect.

§9.10.4 Make the following changes in Section 9.10.4:

In the first sentence, delete the word "the" and replace it with "Unless and until the Contractor makes a subsequent Claim against the Owner, the".

Add the following as the last sentence. "Neither the Owner's offer of a final payment nor its acceptance by the Contractor shall legally prevent or limit the Owner's right to assert any and all counterclaims in litigation filed by the Contractor as allowed in section 15.1.8."

Add the following Sections to Article 9:

§9.11 LIQUIDATED DAMAGES

§9.11.1 The Owner will suffer financial loss if the Work is not Substantially Complete within the Contract Time as defined in Article 8, and if final completion is not achieved within the specified time frame following Substantial Completion. As liquidated damages, and not as a penalty, the Contractor and the Contractor's surety shall be liable for and shall pay the Owner the sum(s) stated in this Agreement and/or purchase order.

§9.11.2 Allowances may be made for delays due to shortages of materials and/or energy resources, subject to proof by documentation, and also for delays due to strikes or other delays beyond the control of the Contractor. All delays and any claim for extension of Contract Time must be properly documented in accordance with Section 15.1.5 by the Contractor and must be made within the time limits stated in Section 15.1.2.

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

§10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

§10.2.8 Make the following changes to Section 10.2.8:

In the first sentence, delete "within a reasonable time not exceeding 21 days" and substitute "immediately".

§10.3 HAZARDOUS MATERIALS

§10.3.3 Delete Section 10.3.3 in its entirety.

ARTICLE 11
INSURANCE AND BONDS

§11.1 CONTRACTOR'S LIABILITY INSURANCE

§11.1.2 Add the following to the end of §11.1.2.

At a minimum the Contract shall provide, at the Contractor's Expense:

§11.1.2.1. a Performance Bond and a Labor and Material Payment Bond for 100% of the Contract Sum and, if applicable, a two-year roofing Maintenance Bond for the full value of the roofing system.

§11.1.2.2 An attorney-in-fact who executes the bonds on behalf of the surety shall affix thereto a certified and current copy of power of attorney.

§11.1.2.3 The bonds shall be issued on State of West Virginia forms. The Contractor shall deliver the required bonds and all other contract documents to the Owner not later than 15 days following receipt of the Owner's notice of intent to award a Contract.

§11.2 Owner's Insurance Delete section 11.2 in its entirety.

§11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

§11.4 Section 11.4 is deleted in its entirety.

§11.5.1 Make the following changes in Section 11.5.1:

In the first sentence, substitute "Contractor" for "Owner" each time the latter word appears.

§11.5.2 Delete Section 11.5.2 in its entirety and substitute the following:

§11.5.2 Prior to settlement of insured loss, the Contractor shall notify the parties of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The parties shall have 14 days from the receipt of notice to object. If no objection is made, the Contractor shall proceed as proposed and allocate the settlement accordingly. If such objection is made, the dispute shall be resolved as provided in Section 15.4. The Contractor, in that case, shall make settlement with insurers in accordance with directions of the Court. If distribution of the insurance proceeds as directed by the Court is required, the Court will direct such distribution. Any work to repair the damage will be incorporated into the contract as a change order.

ARTICLE 13
MISCELLANEOUS PROVISIONS

§13.4 TESTS AND INSPECTIONS

§13.4.1 Remove the phrase "so require" and insert in its place "prohibit delegation of the test to Contractor"

§13.6 INTEREST

§13.6 Delete Section 13.5 in its entirety and substitute the following:

Notwithstanding any other provision in the Contract Documents, West Virginia Code does not authorize the payment of interest on late payments. Accordingly, interest charges for late payment are prohibited.

Add the following Sections to Article 13:

§13.6 WORKERS COMPENSATION

The Contractor shall provide proof of compliance with West Virginia Worker's Compensation laws and regulations.

§13.7 CONTRACTOR'S LICENSE

§13.7.1 West Virginia Code §21-11-2 requires that all persons desiring to perform contractual work in West Virginia shall be duly licensed. The West Virginia Contractor's Licensing Board is empowered to issue a contractor's license.

§13.7.2 West Virginia Code §21-11-11 requires any prospective Bidder to include the Bidder's contractor's license number on its Bid. The successful Bidder will be required to furnish a copy of its contractor's license in a classification appropriate to the Work prior to issuance of a purchase order/contract.

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

§14.1 TERMINATION BY THE CONTRACTOR

§14.1.1 Make the following changes in Section 14.1.1:

At the end of clause 14.1.1.3 delete "; or" and insert a period.

Delete clause 14.1.1.4 in its entirety.

§14.1.3 Delete Section 14.1.3 in its entirety and substitute the following:

§14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exist, the Contractor may, upon seven days written notice to the Owner and Architect, terminate the Contract. In such event, the Contractor shall be paid for all Work performed in accordance with the Contract Documents, for reasonable and proven termination expenses and a reasonable allowance for overhead and profit. However, such payment, exclusive of termination expenses, shall not exceed the Contract Sum as reduced by other payments made to the Contractor and further reduced by the value of Work as yet not completed. The Contractor shall be entitled to reasonable overhead, but not profit, on Work not performed.

§14.2 TERMINATION BY THE OWNER FOR CAUSE

§14.2.4 Delete Section 14.2.4 in its entirety and substitute the following:

§14.2.4 If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other

damages incurred by the Owner and not expressly waived, such excess shall not be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Owner shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§14.4.1 Delete Section 14.4.1 in its entirety and substitute the following:

§14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause upon thirty days written notice.

§14.4.3 Delete Section 14.4.3 in its entirety and substitute the following:

§14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment from the Owner on the same basis provided in Section 14.1.3 above.

Add the following Section to Article 14:

§14.5 FISCAL YEAR FUNDING

§14.5 Work performed under this Contract is to continue in the succeeding fiscal year contingent upon funds being appropriated by the Legislature for this Work. In the event funds are not appropriated for this Work, this Contract becomes of no effect and is null and void after June 30.

ARTICLE 15
CLAIMS AND DISPUTES

§15.1 Claims

§15.1.2 TIME LIMITS ON CLAIMS

§15.1.2 Delete Section 15.1.2 in its entirety and substitute the following:

Any applicable statute of limitations shall be in accordance with West Virginia Code.

§15.1.3 **NOTICE OF CLAIMS** Add the following to § 15.1.3:

§15.1.3.3 All claims, and notice of claims that require an increase in contract time, contract scope, or contract sum must be made in writing.

§ 15.1.8 is added to the Contract as follows:

§ 15.1.8 Counterclaims – In the event that Contractor makes a claim, Owner reserves the right to make a counterclaim and will not be barred from doing so even if final payment has been made.

§15.2 INITIAL DECISION

§15.2.1 In the third sentence of Section 15.2.1 , insert "or litigation" following the word "mediation" and remove the phrase "binding dispute resolution" and replace it with "or litigation".

§15.2.5 Delete the last sentence in Section 15.2.5 and substitute the following:

Approval or rejection of a claim by the Initial Decision Maker shall be final and binding on the parties unless it is pursued further by either party in accordance with Section 15.2.6.

§15.2.6 Make the following change to clause 15.2.6.1:

In the last sentence, delete "or pursue binding dispute resolution proceedings."

§15.2.8 Delete Section 15.2.8 in its entirety.

§15.3 MEDIATION

§15.3.1 Delete "binding dispute resolution" and substitute "litigation in a court of competent jurisdiction."

§15.3.2 Delete Section 15.3.2 in its entirety and substitute the following:

§15.3.2 The parties shall endeavor to resolve their Claims by non-binding mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement.

§ 15.3.3 Remove section 15.3.3 in its entirety

§15.4 ARBITRATION

§15.4 Delete Section 15.4 in its entirety and substitute the following:

§15.4 SETTLEMENT OF CLAIMS

§15.4.1 The Constitution of West Virginia grants the State sovereign immunity from any and all Claims against the public treasury. This immunity applies and is extended to all agencies of the State, including the Owner. It shall be in full force and effect as it relates to this Contract. The West Virginia Legislature, recognizing that certain Claims against the State may constitute a moral obligation of the State and should be heard, has established the West Virginia Claims Commission for this purpose. The Parties understand that this sovereign immunity and the Constitution of the

State of West Virginia prohibit the State and Owner, from entering into binding arbitration. Notwithstanding any provision to the contrary in the Contract Documents, all references to arbitration, regardless of whether they are included in the AIA Document A201-2017 or another related document are hereby deleted and all Claims of the Contractor for monetary relief, and only of the Contractor, arising out of or related to this Contract shall be decided by the West Virginia Claims Commission. The following Sections have been rewritten to bring them into conformance with the foregoing.

§15.4.2 Claims by the Owner may be brought against the Contractor in the Circuit Court of Kanawha County, West Virginia, or in any other court that has jurisdiction, as the Owner may elect.

§15.4.3 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Sections 15.1.6, 9.10.4 and 9.10.5, shall, within 30 days after submission of the decision by the Initial Decision Maker, be settled for the Contractor by the West Virginia Claims Commission or, for the Owner, by the Circuit Court of Kanawha County or any other court of jurisdiction as the Owner may elect.

§15.4.4 Notice of such action shall be filed in writing with the other party to the Contract, and a copy of such notice shall be filed with the Initial Decision Maker and the Architect, if applicable.

§15.4.5 During court proceedings, the Owner and the Contractor shall comply with Section 15.1.3.

§15.4.6 Claims shall be made within the time limits specified in Section 15.2.6.1.

§15.4.7 The party filing a Claim must assert in the demand all Claims then known to that party on which action is permitted.

Add the following Article:

ARTICLE 16
EQUAL OPPORTUNITY

§16.1 COMPLIANCE WITH REGULATIONS UNDER TITLE VI OF THE FEDERAL CIVIL RIGHTS ACT OF 1964 AND EXECUTIVE ORDER 65-2 BY THE GOVERNOR OF WEST VIRGINIA DATED DECEMBER 15, 1965

§16.1.1 The Contractor agrees that it will comply with Title VI of the Federal Civil Rights Act of 1964 (P.L. 88352) and the regulations of the State of West Virginia, to the end that no person in the State, or in the United States, shall on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or otherwise subjected to discrimination under any program or activity for which the Contractor receives any recompense or other consideration of value, either directly or indirectly from the State; and HEREBY GIVES ASSURANCE THAT it will immediately take any measures necessary to effectuate this Agreement.

§16.1.2 If any real property or structure thereon is provided or improved, this assurance shall obligate the Contractor, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which any State payment is extended or for another purpose involving the provision of similar services or benefits. If any other goods or services are so provided, this assurance shall obligate the Contractor for the period during which it supplies such goods or services.

§16.1.3 The Contractor recognizes and agrees that such right to provide property, goods or services to the State will be extended in reliance on the representations and agreements made in assurance, and that the State shall have the right to seek judicial enforcement of this assurance. This is binding on the Contractor, its successors, transferee, and assignee, or any authorized person on behalf of the Contractor.

END OF SUPPLEMENTARY CONDITIONS TO AIA DOCUMENT A201-2017

Any provisions of the Contract Documents that conflict with these Supplementary Conditions shall be null and void unless they have been approved in writing by the applicable State purchasing officer and the Attorney General, and are clearly identified as such in the bid documents.

The Owner and Contractor hereby agree to the full performance of the covenants contained herein.

IN WITNESS WHEREOF, the Owner and Contractor have entered into this Agreement as of the effective date as stated in the A101-2017 (when utilized) or other Contract Documents.

Owner:		Contractor:	
By:	James R Jones	By:	
Title:	Procurement Administrator	Title:	Donald O. Gatewood, President SQP Construction Group, Inc. Project: East Campus Metal Buildings
Date:	3/10/2022	Date:	3/09/2022

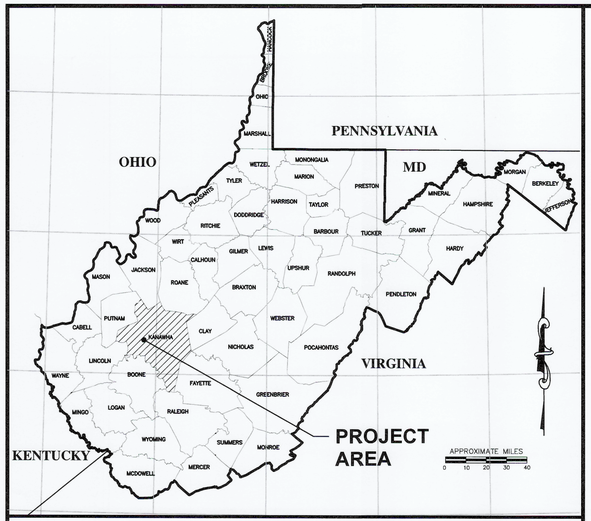
This Supplementary Conditions to AIA Document A201-2017, General Conditions of the Contract for Construction, has been approved as to form on this 20th day of February, 2019, by the West Virginia Attorney General's office as indicated in the signature line below. Any modification of this document is void unless expressly approved in writing by the West Virginia Attorney General's Office.

PATRICK MORRISEY, ATTORNEY GENERAL

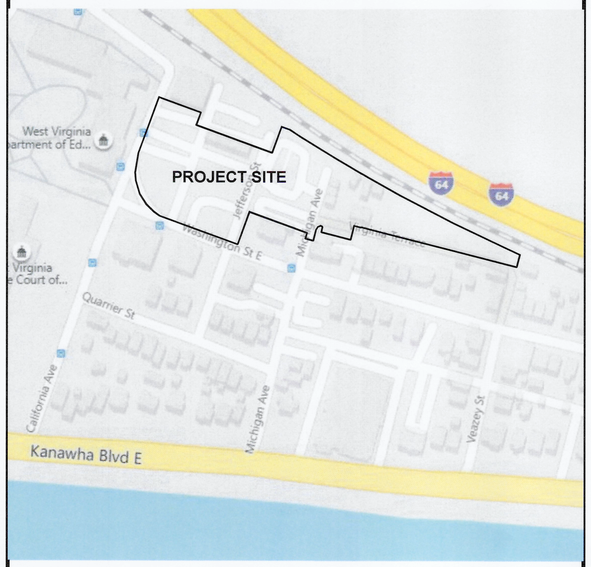
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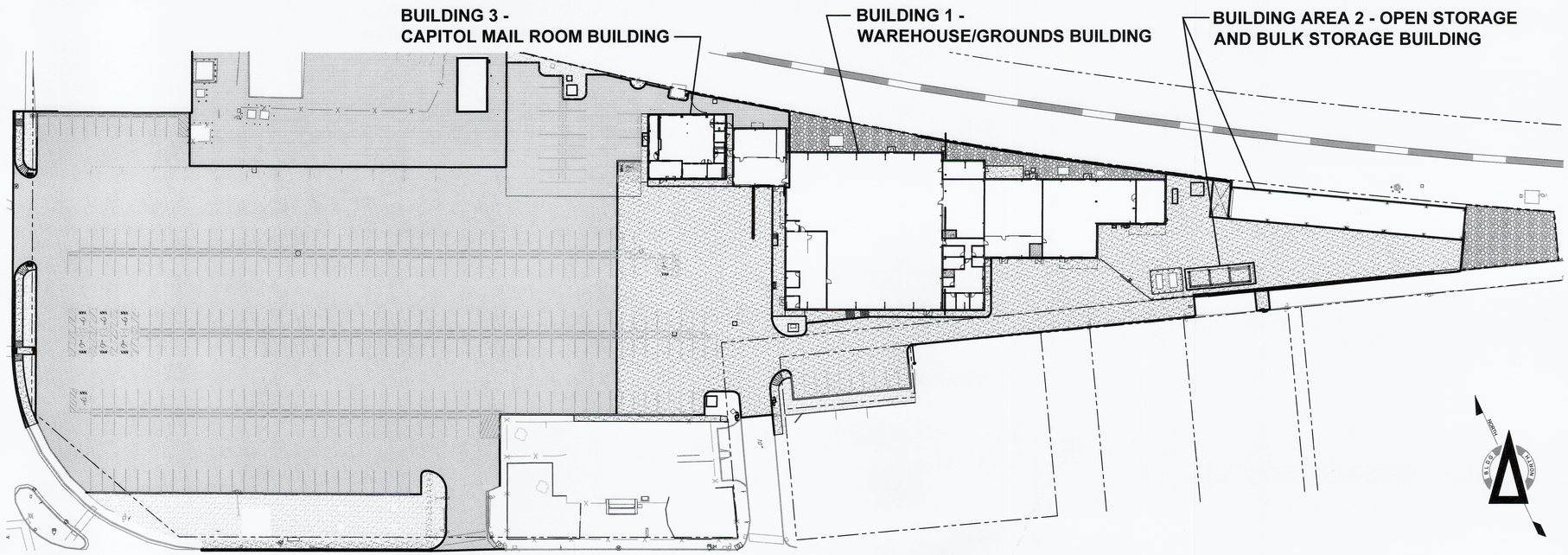
DEPUTY ATTORNEY GENERAL

WEST VIRGINIA DEPARTMENT OF ADMINISTRATION
GENERAL SERVICES DIVISION
CAPITOL EAST CAMPUS
CHARLESTON, WEST VIRGINIA
CONSTRUCTION DOCUMENTS



Vicinity Map





REVISION NUMBER	REVISIONS	DATE	BY

Phillip A. Warnock, AIA, NCARB — 8/6/2021 DATE

STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK — NO. 9821 — REGISTERED ARCHITECT — 8/6/2021

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(304)472-8914

JOB NUMBER:	19027
SCALE:	AS SHOWN
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
G-000	△

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SHEET NUMBER KEY

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D - DISCIPLINE

G - GENERAL
C - CIVIL
S - STRUCTURAL
A - ARCHITECTURAL
F - FIRE PROTECTION
P - PLUMBING
M - MECHANICAL
E - ELECTRICAL

BN - BUILDING NUMBER

1 - WAREHOUSE GROUNDS BUILDING
2 - OPEN STORAGE AND BULK STORAGE BUILDINGS
3 - MAILROOM BUILDING (ALTERNATE 1)

XXX - SHEET SERIES

000 - NOTES
100 - PLANS
200 - ELEVATIONS
300 - SECTIONS
400 - ENLARGED PLANS
500 - DETAILS
600 - SCHEDULES AND DIAGRAMS
700 - MISCELLANEOUS

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West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY AND MAIL ROOM
INDEX OF DRAWINGS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 3527 REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
G-001	

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ARCHITECTURAL ABBREVIATIONS

A.	AREA
A.C.	AIR CONDITIONING
AC. PL.	ACOUSTIC PLASTER
AC. T.	ACOUSTICAL TILE
ACT.	ACTUAL
A.F.F.	ABOVE FINISHED FLOOR
ALUM./AL.	ALUMINUM
AMT.	AMOUNT
APPROX.	APPROXIMATE
AVG.	AVERAGE
A.W.G.	AMERICAN WIRE GAUGE
A.B.	ANCHOR BOLT
<	ANGLE
X.	BY
BD.	BOARD
BD.FT.	BOARD FEET
B.H.	BULKHEAD HEIGHT
BL.	BLOCK
BLDG.	BUILDING
BLKG.	BLOCKING
Bm.	BEAM
BM.	BENCH MARK
B.M.	BOARD MEASURE
BOT.	BOTTOM
B.P.	BEARING PLATE
BRK.	BRICK
BTR.	BETTER
CAULK.	CAULKING
C.B.	CATCH BASIN
C/C	CENTER TO CENTER
CEM.	CEMENT
CER.	CERAMIC
CER. TL.	CERAMIC TILE
CF.	CUBIC FEET
CFM.	CUBIC FEET PER MINUTE
CH.	CEILING HEIGHT
CL.	CENTER LINE
CLG.	CEILING
CLO.	CLOSET
CLR.	CLEAR
C.M.U.	CONCRETE MASONRY UNIT
C.O.	CLEAN OUT
COL.	COLUMN
CONC.	CONCRETE
CONT.	CONTINUOUS
CORR.	CORRIDOR
CPT.	CARPET
C.SK.	COUNTER SINK
CTR/C	CENTER
CU.	CUBIC
C.W.	COLD WATER
C.Y.	CUBIC YARDS
D.	DEPTH/DEEP
DET.	DETAIL
DF./D.F.	DRINKING FOUNTAIN
D.H.	DOUBLE HUNG
DIA./Ø	DIAMETER
DIM.	DIMENSION
DN.	DOWN
DO/do	DITTO
DR.	DOOR
DS.	DOWNSPOUT
DWG.	DRAWING
EA.	EACH
EL/ELEV.	ELEVATION
EXIST.	EXISTING
EXT.	EXTERIOR
E.W.	EACH WAY
E.W.C.	ELEC. WATER COOLER
FD.	FLOOR DRAIN
FDN.	FOUNDATION
F.C./FEC	FIRE EXTINGUISHER CABINET
F.E.	FIRE EXTINGUISHER
FIG.	FIGURE
FIN.	FINISH
FIN. FL./FF.	FINISHED FLOOR
FL.	FLOOR
FLASH.	FLASHING
F.O.	FINISHED OPENING
F.P.M.	FEET PER MINUTE
FT.	FEET
FTG.	FOOTING
GA.	GAUGE
GALV.	GALVANIZED
GL.	GLAZED
GLUE LAM.	GLUE LAMINATED
G.W.B.	GYPSUM WALL BOARD
GYP.	GYPSUM
GYP. BL.	GYPSUM BLOCK
H.B.	HOSE BIB
HC	HANDICAPPED/ACCESSIBLE
HDWE.	HARDWARE
H.M.	HOLLOW METAL
HOL. CR.	HOLLOW CORE
HORZ.	HORIZONTAL
HT.	HEIGHT
H.W.	HOT WATER
I.D.	INSIDE DIAMETER
I.P.	IRON PIN
INSUL.	INSULATION
INT.	INTERIOR
JT.	JOINT
L.	LENGTH
LAV.	LAVATORY
L.H.	LEFT HAND
L.F./LIN.FT.	LINEAR FEET
MATL.	MATERIAL
MAX.	MAXIMUM
MECH.	MECHANICAL
MET.	METAL
MFR.	MANUFACTURER
MIN.	MINIMUM
MISC.	MISCELLANEOUS
M.O.	MASONRY OPENING
N.	NORTH
N.A.	NOT APPLICABLE
N.E.C.	NATIONAL ELECTRIC CODE
N.I.C.	NOT IN CONTRACT
NO./#	NUMBER
NOM.	NOMINAL
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
O.D.	OUTSIDE DIMENSION
OPP.	OPPOSITE
OVHD.	OVERHEAD
PERP.	PERPENDICULAR
PL.	PLATE
PLWD.	PLYWOOD
PR.	PAIR
P.S.I.	POUNDS PER SQUARE INCH
P.S.F.	POUNDS PER SQUARE FOOT
PT.	PAINT
P.T.	PRESERVATIVE TREATED
PTD.	PAINTED
Q.T.	QUARRY TILE
QTY.	QUANTITY
R.	RISER/RADIUS
R.D.	ROOF DRAIN/ROUND
RE.BAR.	REINFORCING BAR
RECEP.	RECEPTACLE
REF.	REFERENCE
REINF.	REINFORCING
REQD.	REQUIRED
REV.	REVISION/REVISED
R.H.	RIGHT HAND
RM.	ROOM
R.O.	ROUGH OPENING
S.	SOUTH
S.C.	SOLID CORE
SCH.	SCHEDULE
SEC.	SECTION
S.F.	SQUARE FEET
SHT.	SHEET
SHTG.	SHEATHING
SPECS.	SPECIFICATIONS
STD.	STANDARD
STL.	STEEL
STRUCT.	STRUCTURAL
SUSP.	SUSPENDED
T.	TREAD/THICKNESS
T.&G.	TONGUE AND GROOVE
TYP.	TYPICAL
UNFIN.	UNFINISHED
U.N.O.	UNLESS NOTED OTHERWISE
V.	VINYL
VERT.	VERTICAL
V.C.T.	VINYL COMPOSITION TILE
V.T.R.	VENT THROUGH ROOF
W.	WIDTH/WATER
W/	WITH
W.C.	WATER CLOSET
WD.	WOOD
WDW.	WINDOW
W.GL.	WIRE GLASS
WP.	WATERPROOF
W/O	WITHOUT
WT.	WEIGHT
YD.	YARD/YARDS

LEGEND

- X — DOOR NUMBER
- XXX — WINDOW TYPE
- X — CONSTRUCTION NOTE, CONSTRUCTION NOTES ARE SPECIFIC TO THE SHEET ON WHICH THEY APPEAR.
- XX — WALL TYPE, SEE PLAN & SCHEDULE
- XX — DEMOLITION NOTE, DEMOLITION NOTES ARE SPECIFIC TO THE SHEET ON WHICH THEY APPEAR.
- X — EQUIPMENT TAG
- 1-HR FIRE BARRIER (WALL)
- 2-HR FIRE BARRIER (WALL)
- 3-HR FIRE BARRIER (WALL)
- SMOKE PARTITION
- F — MANUAL FIRE ALARM PULL
- 2x2 FLUORESCENT FIXTURE
- 2x4 FLUORESCENT FIXTURE
- DIFFUSER, SEE MECHANICAL DRAWINGS
- RETURN GRILLE, SEE MECHANICAL DRAWINGS
- XX / X-X-XX — SECTION - MARKER INDICATES BUILDING SECTION, WALL SECTION OR BUILDING COMPONENT AT LARGER SCALE ELSEWHERE
- XX / X-X-XX — DETAIL MARKER - INDICATES LARGE SCALE DETAIL ELSEWHERE - NUMERICAL

GENERAL NOTES

1. PERFORM ALL WORK IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL CODES AND REGULATIONS.
2. COORDINATE WORK WITH OTHER CONTRACTORS AND UTILITY COMPANIES, INCLUDING CONTRACTORS FOR OTHER PROJECTS, SANITARY BOARD, WATER COMPANY, POWER COMPANY, CABLE COMPANY, PHONE COMPANY, AND INTERNET DATA COMPANY.
3. AT ALL BUILDINGS FINISH FLOOR ELEVATION, 100'-0 FIRST FLOOR, IS RELATIVE. F.F.E. 100'-0" = NAVD 88 ELEVATION 600.33'
4. OBTAIN REQUIRED PERMITS PERTAINING TO THE BUILDING PRIOR TO THE START OF CONSTRUCTION.
5. DIMENSIONS ARE TO FACE OF WALL AND CENTERLINE OF BEAMS AND COLUMNS UNLESS NOTED OTHERWISE. EXTERIOR WALLS ARE TO INSIDE FACE OF PRECAST WALL.
6. ALL ANGLES AT INCREMENTS OF 45 DEGREES UNLESS NOTED OTHERWISE.
7. VERIFY COMPATIBILITY OF PRODUCTS WITH EACH OTHER AND WITH THEIR INTENDED PURPOSES.
8. PROVIDE THROUGH PENETRATION FIRE STOP SYSTEM AT PENETRATIONS AND AROUND OPENINGS THROUGH FIRE RATED WALLS, CEILINGS AND FLOORS. PROVIDE RATED DOOR FRAMES, RATED DOORS AND RATED HARDWARE INCLUDING FIRE SEALS AND CLOSERS AT DOORS IN RATED WALLS.
9. PROVIDE SMOKE-TIGHT SEALANT AT ALL DOORS AND OTHER PENETRATIONS THROUGH SMOKE PARTITIONS AND SMOKE DAMPERS IN DUCTWORK PER APPLICABLE CODES, SEE MEP DRAWINGS AND SPECIFICATIONS FOR MECHANICAL, ELECTRICAL AND PLUMBING REQUIREMENTS.
10. LOCATE HINGE SIDE OF DOOR FRAMES AT 4" OFF FACE OF ADJACENT WALL UNLESS DIMENSIONED OTHERWISE. PROVIDE 8" AT OFFICES.
11. FINISH COLORS FOR ALL MATERIALS, INTERIOR AND EXTERIOR, SHALL BE SELECTED BY ARCHITECT.
12. SLOPE SIDEWALKS AND SHAPE EARTH TO DRAIN AWAY FROM ALL BUILDINGS WITHOUT PONDING.
13. LOCATE UTILITIES ON SITE PRIOR TO EXCAVATING. THE CONTRACTOR SHALL EXERCISE CARE SO AS NOT TO DAMAGE UTILITIES DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE APPROPRIATE UTILITY COMPANIES IN THE EVENT UTILITY LINES REQUIRE RELOCATION. THE CONTRACTOR SHALL REPAIR ANY UTILITY LINES DAMAGED BY THE CONTRACTOR IMMEDIATELY AND TO THE SATISFACTION OF THE UTILITY COMPANY.
14. VERIFY ALL CONDITIONS AND DIMENSIONS ON THE JOB SITE. IF EXISTING FIELD CONDITIONS DO NOT PERMIT INSTALLATION OF THE WORK IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS, NOTIFY THE ARCHITECT IMMEDIATELY AND PROVIDE A SKETCH OF THE CONDITION.
15. DETAILS SHOWN ARE INTENDED FOR SPECIFIC LOCATIONS AND CONDITIONS. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT SIMILAR CONDITIONS AND SHALL BE CONSIDERED PART OF THE WORK.
16. DO NOT SCALE DRAWINGS.
17. COORDINATE LOCATION AND SIZE OF ALL OPENINGS INTERIOR AND/OR EXTERIOR WITH ALL TRADES PRIOR TO INSTALLATION. MASONRY OPENING DIMENSIONS ARE NOMINAL. PROVIDE ADDITIONAL CLEARANCE REQUIRED BY MANUFACTURER PER INSTALLATION OF BUILDING ELEMENTS.
18. VERIFY THAT INSERTS AND EMBEDDED ITEMS REQUIRED BY ALL TRADES ARE INSTALLED PRIOR TO POURING OF CONCRETE OR FABRICATION OF PRECAST PANELS.
19. COORDINATE ALL SLEEVING WORK, INCLUDING WORK "FUTURE" UTILITIES AND FIXTURES.
20. UNLESS OTHERWISE INDICATED ON THE DRAWINGS OR IN THE SPECIFICATIONS AS BEING "N.I.C.", "FUTURE" OR BY OWNER, ALL ITEMS, MATERIALS, ETC. AND INSTALLATION OF SAME ARE A PART OF THE CONTRACT WORK.
21. IN ALL CIRCUMSTANCES, ISOLATE ALUMINUM FROM CONTACT WITH STEEL, CMU, AND/OR CONCRETE.
22. PROVIDE ALL NECESSARY BACKING AND FRAMING FOR ALL MOUNTED ITEMS INCLUDING, BUT NOT LIMITED TO LIGHT FIXTURES, MIRRORS AND ALL OTHER ITEMS REQUIRING SAME. BACKING MUST BE CAPABLE OF CARRYING LOADS OF HUNG ITEMS AND MAY BE A COMBINATION OF STEEL PLATES, STEEL ANGLES, COLD ROLLED CHANNELS AND BLOCKING. PROVIDE FASTENERS AND/OR WELDING FOR BACKING.
23. PROVIDE ELECTRICAL GROUND FOR ALL STEEL TO STEEL CONNECTIONS.
24. PROVIDE CONCEALED CONDUIT WHEREVER POSSIBLE, EXPOSED CONDUIT IS ACCEPTABLE ONLY WITH THE APPROVAL OF THE ARCHITECT. EXPOSED CONDUIT WILL BE REQUIRED AT EXPOSED PRECAST PANELS. USE ELECTRICAL BILLETS PROVIDED IN PRECAST PANEL WALLS FOR VERTICAL ELECTRICAL DROPS TO AVOID EXPOSED CONDUIT AS MUCH AS POSSIBLE. IN ALL CASES, PROVIDE NEAT, ORDERLY CONDUIT, MOUNTED HIGH ON WALLS.
25. PREPARE SUBSTRATES AND INSTALL ALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS FOR THE CONDITIONS AND APPLICATIONS INTENDED.
26. PROTECT WALLS OF BUILDING FROM BEING MARRED BY PAVING OPERATIONS.
27. PROVIDE, COORDINATE, AND INTEGRATE CARDKEY ACCESS WITH CAPITOL PROTECTIVE SERVICES SYSTEM.
28. PROVIDE A WEATHER TIGHT AND SECURE, TEMPORARY BARRIER AT ALL LOCATIONS THAT MAY ALLOW ACCESS FOR INCLIMATE WEATHER OR UNWANTED VISITORS DURING DEMOLITION AND CONSTRUCTION.
29. PROTECT BATT INSULATION FROM MOISTURE. REPLACE BATT INSULATION THAT GETS WET.

REVISION NUMBER	REVISIONS	DATE	BY

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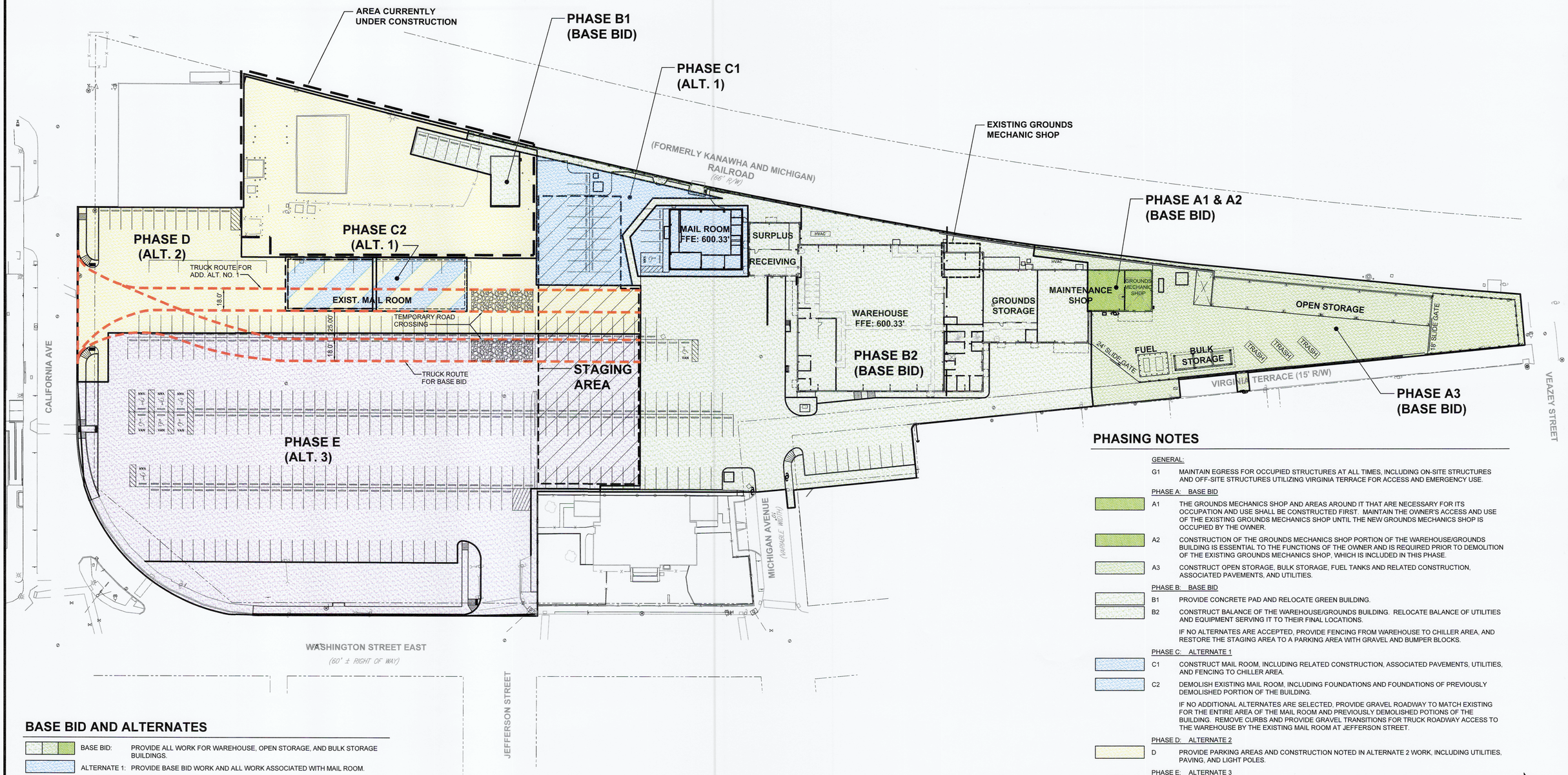
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY AND MAIL ROOM
GENERAL NOTES

SEAL — STATE OF WEST VIRGINIA — PHILLIP ALAN WASHOOK NO. 22624 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
G-002	△

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BASE BID AND ALTERNATES

- BASE BID: PROVIDE ALL WORK FOR WAREHOUSE, OPEN STORAGE, AND BULK STORAGE BUILDINGS.
- ALTERNATE 1: PROVIDE BASE BID WORK AND ALL WORK ASSOCIATED WITH MAIL ROOM.
- ALTERNATE 2: PROVIDE BASE BID, ALTERNATE 1, AND ALL WORK ASSOCIATED WITH GENERATOR YARD, ROAD, AND PARKING AREA NOTED.
- ALTERNATE 3: PROVIDE BASE BID, ALTERNATE 1, ALTERNATE 2, AND ALL WORK ASSOCIATED WITH THE PARKING AREA NOTED.
- STAGING AREA

PHASING NOTES

GENERAL:

G1 MAINTAIN EGRESS FOR OCCUPIED STRUCTURES AT ALL TIMES, INCLUDING ON-SITE STRUCTURES AND OFF-SITE STRUCTURES UTILIZING VIRGINIA TERRACE FOR ACCESS AND EMERGENCY USE.

PHASE A: BASE BID

A1 THE GROUNDS MECHANICS SHOP AND AREAS AROUND IT THAT ARE NECESSARY FOR ITS OCCUPATION AND USE SHALL BE CONSTRUCTED FIRST. MAINTAIN THE OWNER'S ACCESS AND USE OF THE EXISTING GROUNDS MECHANICS SHOP UNTIL THE NEW GROUNDS MECHANICS SHOP IS OCCUPIED BY THE OWNER.

A2 CONSTRUCTION OF THE GROUNDS MECHANICS SHOP PORTION OF THE WAREHOUSE/GROUNDS BUILDING IS ESSENTIAL TO THE FUNCTIONS OF THE OWNER AND IS REQUIRED PRIOR TO DEMOLITION OF THE EXISTING GROUNDS MECHANICS SHOP, WHICH IS INCLUDED IN THIS PHASE.

A3 CONSTRUCT OPEN STORAGE, BULK STORAGE, FUEL TANKS AND RELATED CONSTRUCTION, ASSOCIATED PAVEMENTS, AND UTILITIES.

PHASE B: BASE BID

B1 PROVIDE CONCRETE PAD AND RELOCATE GREEN BUILDING.

B2 CONSTRUCT BALANCE OF THE WAREHOUSE/GROUNDS BUILDING. RELOCATE BALANCE OF UTILITIES AND EQUIPMENT SERVING IT TO THEIR FINAL LOCATIONS.

IF NO ALTERNATES ARE ACCEPTED, PROVIDE FENCING FROM WAREHOUSE TO CHILLER AREA, AND RESTORE THE STAGING AREA TO A PARKING AREA WITH GRAVEL AND BUMPER BLOCKS.

PHASE C: ALTERNATE 1

C1 CONSTRUCT MAIL ROOM, INCLUDING RELATED CONSTRUCTION, ASSOCIATED PAVEMENTS, UTILITIES, AND FENCING TO CHILLER AREA.

C2 DEMOLISH EXISTING MAIL ROOM, INCLUDING FOUNDATIONS AND FOUNDATIONS OF PREVIOUSLY DEMOLISHED PORTION OF THE BUILDING.

IF NO ADDITIONAL ALTERNATES ARE SELECTED, PROVIDE GRAVEL ROADWAY TO MATCH EXISTING FOR THE ENTIRE AREA OF THE MAIL ROOM AND PREVIOUSLY DEMOLISHED POTIONS OF THE BUILDING. REMOVE CURBS AND PROVIDE GRAVEL TRANSITIONS FOR TRUCK ROADWAY ACCESS TO THE WAREHOUSE BY THE EXISTING MAIL ROOM AT JEFFERSON STREET.

PHASE D: ALTERNATE 2

D PROVIDE PARKING AREAS AND CONSTRUCTION NOTED IN ALTERNATE 2 WORK, INCLUDING UTILITIES, PAVING, AND LIGHT POLES.

PHASE E: ALTERNATE 3

E PROVIDE PARKING AREAS AND CONSTRUCTION NOTED IN ALTERNATE 3 WORK, INCLUDING UTILITIES, PAVING, LIGHT POLES, AND STORM RETENTION AREAS.

40 0 20 40 80

NORTH

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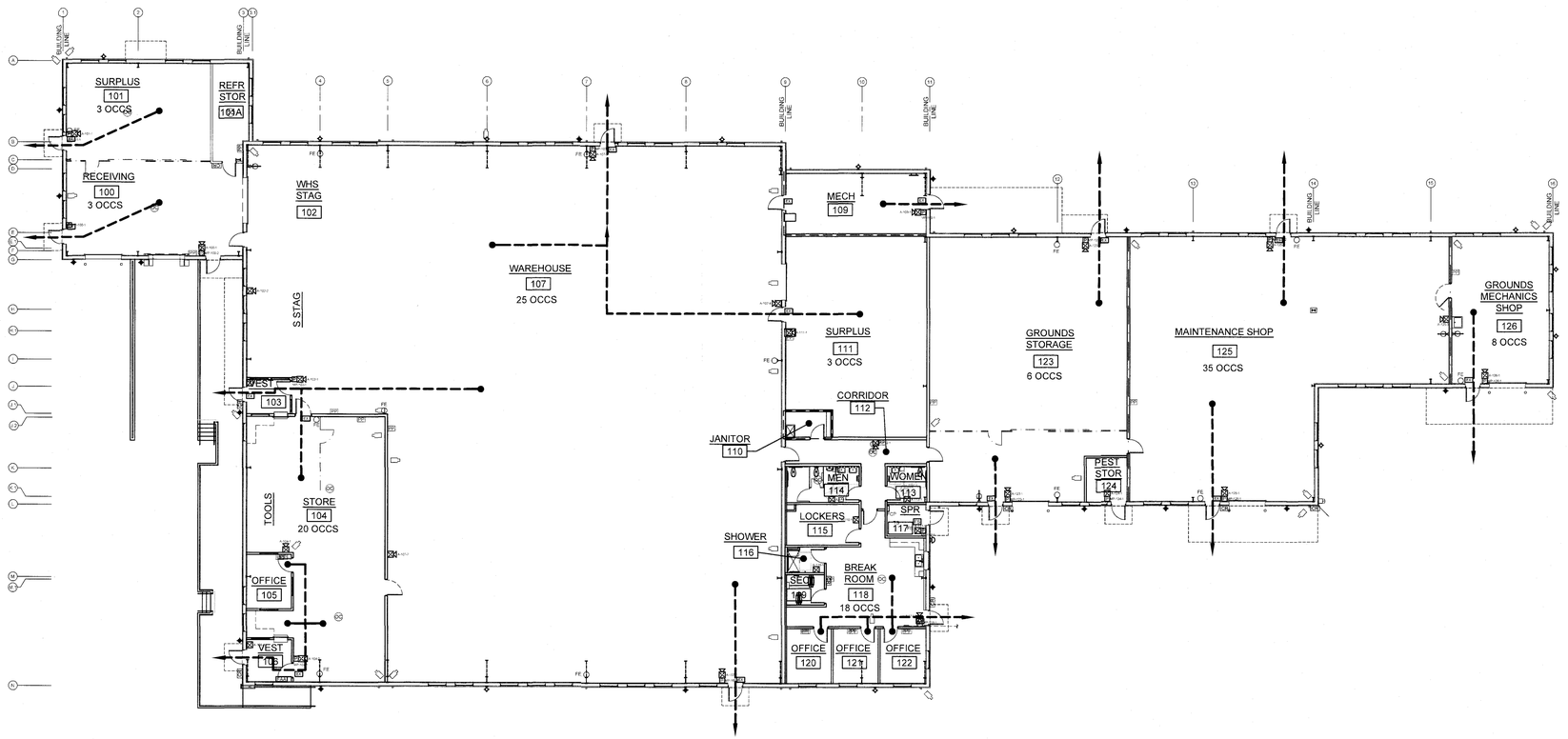
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ALTERNATES AND PHASING PLAN

STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK NO. 21021 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	JEB
SHEET NO.	REVISION
G-003	

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1 A-1-100 **EGRESS PLAN**
SCALE: 1/16" = 1'-0"

EGRESS LEGEND

	EGRESS PATH	
FSA	ANNUNCIATOR PANEL	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
FCP	FIRE ALARM CONTROL PANEL	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
P	FIRE ALARM PULL STATION	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
	FIRE ALARM SPEAKER/HORN/STROBE LIGHT	
FEC	FIRE EXTINGUISHER CABINET	
FE	FIRE EXTINGUISHER W/WALL MOUNT BRACKET	
EX	ILLUMINATED EXIT SIGN	
	WALLS	
	SMOKE PARTITION FLOOR TO DECK AND SEAL. SEAL ALL WALL PENETRATIONS.	
	1 HOUR RATED WALL FLOOR TO DECK AND SEAL. SEAL ALL WALL PAENETRATIONS.	

CODE NOTES

REQUIRED CODES:

- WV STATE FIRE CODE - AUGUST 1, 2020
- WV BUILDING CODE - AUGUST 1, 2020
- NFPA 101-2018
- IBC-2015
- IPC-2015
- IMC-2015
- IFGC-2015
- NEC NFPA 70-2017
- ANSI/IESNA 90.1-2010
-ICC/ANSI A117.1-2017

GENERAL INFORMATION:

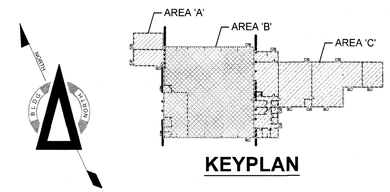
WAREHOUSE BUILDING - 1 26,771 S.F.

WV FIRE CODE:

- TYPE II (000), SPRINKLERED
- OCCUPANCY:
  - STORAGE 22,360 SF
  - INDUSTRIAL, GENERAL 3,508 SF
  - INDUSTRIAL, SPECIAL-PURPOSE (VEHICLE REPAIR) 780 SF
- OCCUPANT LOAD: TOTAL 121 OCCS
- MAX DEAD END CORRIDOR 50'
- MAX COMMON PATH 75'
- MAX TRAVEL DISTANCE 200'

NFPA 55-
COMPRESSED GASSES STORAGE WILL INCLUDE NON-TOXIC, NON-PYROPHORIC, NON-FLAMMABLE, NON-OXIDIZING, NON-CORROSIVE, STABLE REFRIGERANT GAS WHICH WILL BE SECURED AGAINST DISLODGEMENT AND UNAUTHORIZED ACCESS WHILE MAINTAINING CONTAINERS AND AREA AT LESS THAN 125 DEGREES FAHRENHEIT.

0' 8' 16' 32' 48'
SCALE: 1" = 16'



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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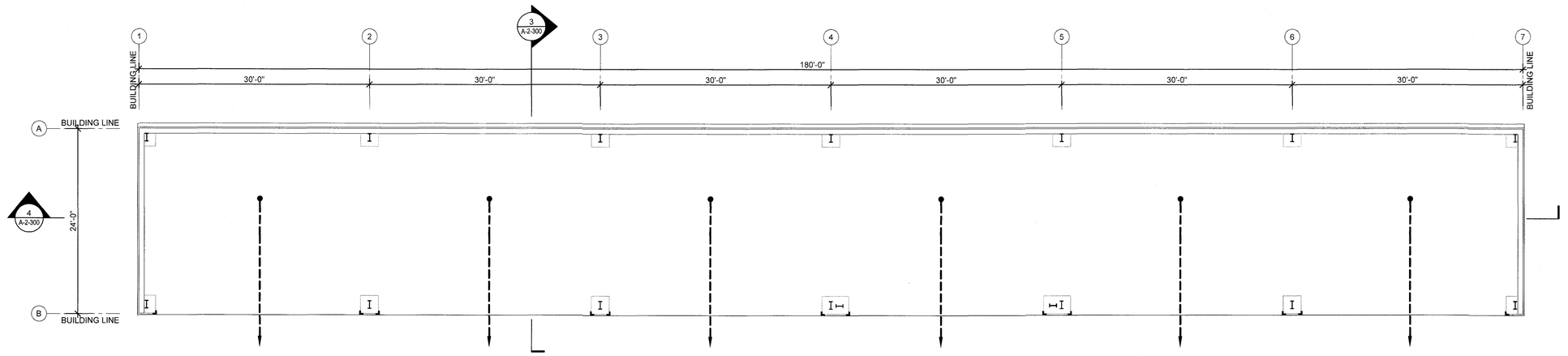
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
WAREHOUSE EGRESS PLAN

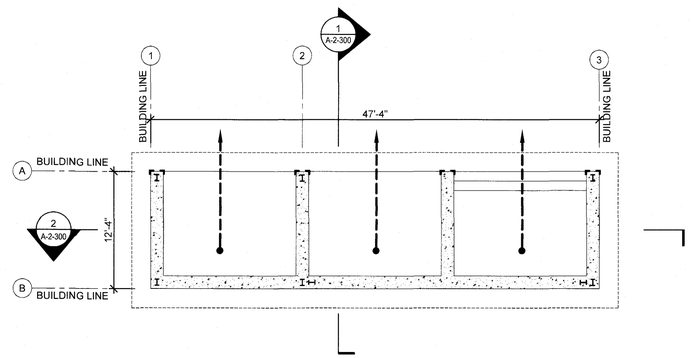
SEAL OF WEST VIRGINIA
PHILLIP ALAN WAYNOCK
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	G-1-100
REVISION	△

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1 A-2-100 **OPEN STORAGE PLAN**
SCALE: 1/8" = 1'-0"



2 A-2-100 **OPEN BULK STORAGE PLAN**
SCALE: 1/8" = 1'-0"

CODE NOTES

REQUIRED CODES:

- WV STATE FIRE CODE - AUGUST 1, 2020
- WV BUILDING CODE - AUGUST 1, 2020
- NFPA 101-2018
- EXISTING BUILDING CODE-2015 AND IBC-2015
- IPC-2015
- IMC-2015
- IFGC-2015
- NEC NFPA 70-2017
- ANSI/IESNA 90.1-2010
-ICC/ANSI A117.1-2017

GENERAL INFORMATION:

OPEN STORAGE BUILDING	4,320 S.F.
OPEN BULK STORAGE BUILDING	584 S.F.
TOTAL	4,904 S.F.

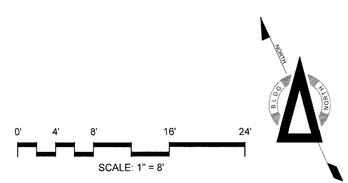
WV FIRE CODE:

- TYPE II (000), UNSPRINKLERED
- OCCUPANCY: BUSINESS

- OCCUPANT LOAD:	TOTAL	N/A OCCS
- MAX DEAD END CORRIDOR		50'
- MAX COMMON PATH		75'
- MAX TRAVEL DISTANCE		200'

EGRESS LEGEND

	EGRESS PATH	
FSA	ANNUNCIATOR PANEL	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
FCP	FIRE ALARM CONTROL PANEL	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
P	FIRE ALARM PULL STATION	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
	FIRE ALARM SPEAKER/HORN/STROBE LIGHT	
FEC	FIRE EXTINGUISHER CABINET	
FE	FIRE EXTINGUISHER W/WALL MOUNT BRACKET	
EX	ILLUMINATED EXIT SIGN	
	WALLS	
	SMOKE PARTITION FLOOR TO DECK AND SEAL. SEAL ALL WALL PENETRATIONS.	
	1 HOUR RATED WALL FLOOR TO DECK AND SEAL. SEAL ALL WALL PAENETRATIONS.	



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PROJECT INFORMATION
West Virginia Department of Administration
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OPEN STORAGE EGRESS PLANS

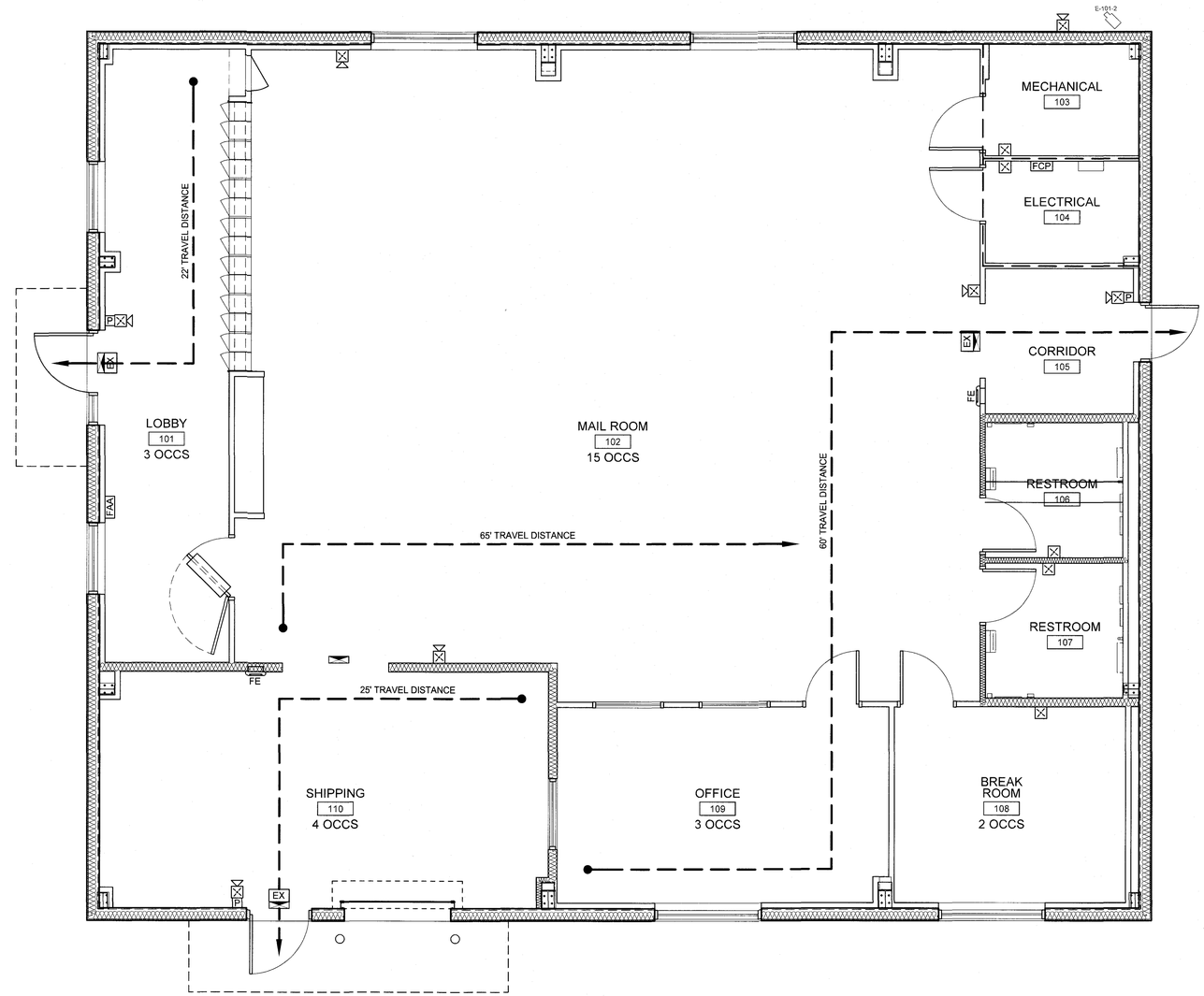
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 19027
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
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EGRESS LEGEND

←— — —●	EGRESS PATH	
FAA	FIRE ANNUNCIATOR PANEL	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
FCP	FIRE ALARM CONTROL PANEL	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
P	FIRE ALARM PULL STATION	(SEE ELECTRICAL DWGS FOR ALL LOCATIONS)
	FIRE ALARM SPEAKER/HORN/STROBE LIGHT	
FE	FIRE EXTINGUISHER, MULTIPURPOSE DRY-CHEMICAL TYPE (FE-1) IN SEMI RECESSED CABINET (EC-1)	
EX	ILLUMINATED EXIT SIGN	
	SMOKE PARTITION FLOOR TO DECK AND SEAL. SEAL ALL WALL PENETRATIONS.	



1 G-3-101 **EGRESS PLAN**
SCALE: 1/4" = 1'-0"

CODE NOTES

REQUIRED CODES:

- WV STATE FIRE CODE - AUGUST 1, 2020
- WV BUILDING CODE - AUGUST 1, 2020
- NFPA 101-2018
- EXISTING BUILDING CODE-2015 AND IBC-2015
- IPC-2015
- IMC-2015
- IFGC-2015
- NEC NFPA 70-2017
- ANSI/IESNA 90.1-2010
-ICC/ANSI A117.1-2017

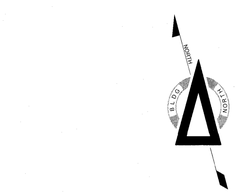
GENERAL INFORMATION:

MAILROOM BUILDING - 3	3,000 S.F.
- TYPE VB, MINUMUM	TYPE II (000) PROVIDED

WV FIRE CODE:

- TYPE II (000), SPRINKLERED
- OCCUPANCY: BUSINESS

- OCCUPANT LOAD:	TOTAL	30 OCCS
- MAX DEAD END CORRIDOR		50'
- MAX COMMON PATH		75'
- MAX TRAVEL DISTANCE		200'
- AREAS OF REFUGE ARE REQUIRED		



0' 2' 4' 8' 12'
SCALE: 1/4" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

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AIRPORT PLANNING / DEVELOPMENT
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1

MAIL ROOM EGRESS PLAN

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 23
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	1/4" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
G-3-100	

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GENERAL NOTES

1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR SITE SAFETY ASSOCIATED WITH THE WORK UNDER THIS PROJECT AND FOR COMPLIANCE WITH ALL FEDERAL, STATE, AND LOCAL HEALTH AND SAFETY LAWS, CODES, REGULATIONS, AND ORDINANCES INCLUDING BUT NOT LIMITED TO THOSE CURRENTLY MANDATED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
2. CONTRACTOR SHALL NOTIFY MISS UTILITY (811) 48 HOURS IN ADVANCE OF START OF CONSTRUCTION ACTIVITIES. CONTRACTOR IS SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING UNDERGROUND OR ABOVE GROUND UTILITIES.
3. THE INFORMATION SHOWN ON THE DRAWINGS CONCERNING TYPE, SIZE, AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE, SIZE, AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
4. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL DAMAGE TO ABOVE GROUND OR UNDERGROUND UTILITIES AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT.
5. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS, ALL DIMENSIONS, AND ELEVATIONS AT THE SITE. WHERE CONDITIONS VARY FROM THOSE SHOWN ON THE PLANS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF SUCH CONDITIONS AND OBTAIN AUTHORIZATION BEFORE PROCEEDING WITH ADJUSTMENTS NECESSARY FOR INSTALLATION AND COMPLETION OF THE WORK.
6. THE CONTRACTOR SHALL EXCAVATE TEST PITS TO DETERMINE ACTUAL DEPTH OF EXISTING UTILITIES IN THE VICINITY OF WORK. VERIFICATION OF EXISTING UTILITIES SHALL TAKE PLACE WITH AMPLE TIME TO ADJUST PROPOSED ELEVATIONS AND ALIGNMENTS OF NEW WORK PRIOR TO INSTALLATION.
7. DEVIATIONS FROM THESE PLANS WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER MAY BE CAUSE FOR WORK TO BE UNACCEPTABLE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH LOCAL OVERHEAD UTILITY COMPANIES FOR ANY ADDITIONAL SUPPORT OF EXISTING UTILITY POLES AS REQUIRED FOR TRENCH EXCAVATION. ALL COSTS OF SUCH WORK SHALL BE PAID BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
9. COORDINATE CONNECTIONS TO EXISTING UTILITIES WITH THE OWNER AND ENGINEER.
10. WHERE NEW WORK JOINS EXISTING WORK AND WHERE ALTERATIONS TO EXISTING WORK CAUSE DAMAGE TO THE REMAINING EXISTING WORK, THE CONTRACTOR SHALL RESTORE SAID PLACE AND AREAS TO FINISHED CONDITION, CONSISTENT WITH NEW WORK USING IDENTICAL MATERIALS FOR PATCHING, PAINTING, REPAIRING, ETC.
11. MAINTAIN 10' HORIZONTAL OR 18" VERTICAL CLEARANCE BETWEEN WATER AND SEWER MAINS, NEW AND EXISTING.
12. UPON COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL FURNISH THE ENGINEER A RED-LINE SET OF RECORD DRAWINGS. RECORD DRAWINGS SHOULD INDICATE LENGTHS OF INSTALLED PIPE, LOCATIONS OF FITTINGS AND SPECIALS, AND FINAL INSTALLED MANHOLE INVERT ELEVATIONS.
13. ALL NECESSARY LICENSES AND PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT ITS EXPENSE, UNLESS PREVIOUSLY OBTAINED BY THE OWNER.
14. ALL PIPE LENGTHS AND DISTANCES BETWEEN STRUCTURES ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE ALONG A HORIZONTAL PLANE.
15. ELEVATIONS SHOWN ARE BASED ON NAVD 88.
16. THE CONTRACTOR SHALL PROVIDE ALL STAKEOUT SURVEY. ANY EXISTING STAKE OUT SHALL NOT BE USED BY THE CONTRACTOR.
17. ALL DISTURBED PROPERTY PINS SHALL BE RESET BY A LICENSED PROFESSIONAL SURVEYOR, AT THE CONTRACTOR'S EXPENSE.
18. THE CONTRACTOR SHALL REINSTALL ALL SIGNS REMOVED OR DAMAGED DURING CONSTRUCTION AS REQUIRED AS REQUIRED BY LOCAL DOT ALONG ROADWAYS.
19. ALL PAVEMENT CUTS SHALL BE SAW CUT ALONG A STRAIGHT CONTINUOUS EDGE.
20. THE CONTRACTOR SHALL REMOVE AND REINSTALL ALL EXISTING FENCE AS REQUIRED FOR PIPE INSTALLATION. ANY ADDITIONAL FENCE MATERIALS REQUIRED SHALL BE PROVIDED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. NO FENCE POSTS SHALL BE PLACED WITHIN 5' OF THE PIPE.
21. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL SHEETING AND SHORING REQUIRED FOR THE INSTALLATION OF THE UTILITY, ALL EXCAVATIONS SHALL BE KEPT WITHIN THE DESIGNATED EASEMENT WIDTHS, EXCAVATION WITHIN PAVED AREAS SHALL BE KEPT TO A MINIMUM. SHEETING SHALL BE INSTALLED AS REQUIRED TO PROTECT EXISTING UTILITIES, ROADS, ETC.
22. CONTRACTOR SHALL PLAN AND CONSTRUCT WORK SO AS TO CAUSE MINIMUM INCONVENIENCE TO THE OWNER AND PUBLIC. THE CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AND ERECT AND MAINTAIN AT ALL TIMES DURING THE PROGRESS OR TEMPORARY SUSPENSION OF WORK, SUITABLE BARRIERS, FENCES, SIGNS OR OTHER ADEQUATE PROTECTION, INCLUDING FLAG MEN AND WATCHMEN AS NECESSARY TO INSURE THE SAFETY OF THE PUBLIC AS WELL AS THOSE ENGAGED IN THE CONSTRUCTION WORK. CONSTRUCTION SIGNAGE SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "CONSTRUCTION AND MAINTENANCE OPERATIONS SUPPLEMENT TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" OR AS OTHERWISE REQUIRED BY THE LOCAL DOT.
23. WHERE THE CONTRACTOR DETERMINES THAT ENCROACHMENT ONTO PRIVATE PROPERTY IS NECESSARY, AND AN EASEMENT HAS NOT BEEN PROVIDED, THE CONTRACTOR SHALL CONTACT INDIVIDUAL PROPERTY OWNERS AND OBTAIN WRITTEN APPROVAL FOR THAT ENCROACHMENT.
24. CONTRACTOR SHALL NOTIFY HOME OWNERS AT LEAST 7 DAYS PRIOR TO CONSTRUCTION THAT CONSTRUCTION ACTIVITY WILL TAKE PLACE IN THEIR AREA.
25. ENVIRONMENTAL PROTECTION: IN ORDER TO PREVENT AND TO PROVIDE FOR ABATEMENT AND CONTROL OF ANY ENVIRONMENTAL POLLUTION ARISING FROM THEIR CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS CONCERNING ENVIRONMENTAL POLLUTION CONTROL AND ABATEMENT, AS WELL AS SPECIFIC REQUIREMENTS AND CONDITIONS OF ANY NECESSARY PERMITS FOR CONSTRUCTION OBTAINED BY THE OWNER.
26. EXISTING VEGETATION OUTSIDE OF THE CLEARING LIMITS TO REMAIN SHALL BE PROTECTED FROM DAMAGE.
27. SURFACE AND GROUND WATER CONTROL IS THE CONTRACTORS RESPONSIBILITY. AS SUCH, TEMPORARY GRADING, DIVERSION DITCHES, AND DEWATERING EQUIPMENT MAY BE REQUIRED. ANY SATURATED OR OTHERWISE DAMAGED SUBGRADE WILL BE REMOVED AND REPLACED WITH SUITABLE FILL MATERIALS AT NO ADDITIONAL COST TO THE OWNER.
28. THE CONTRACTOR SHALL NOT USE EXISTING SANITARY SEWERS AS A MEANS OF DEWATERING DURING CONSTRUCTION WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURFACE WATER RUNOFF AND GROUND WATER FROM THE TRENCHES AND SHALL PROVIDE NECESSARY DEWATERING AND PUMPING EQUIPMENT FOR HANDLING THESE FLOWS DURING CONSTRUCTION. DEWATERING ACTIVITIES TO COMPLY WITH ALL FEDERAL, STATE, AND LOCAL LAWS. ANY ADDITIONAL PERMITS REQUIRED AS A RESULT OF DEWATERING ACTIVITIES ARE THE CONTRACTOR'S RESPONSIBILITY. ALL DEWATERING COSTS ARE CONSIDERED ANCILLARY TO THE COST OF WORK AND NO ADDITIONAL COMPENSATION WILL BE CONSIDERED FOR DEWATERING.
29. ALL WATER AND SEWER MAIN CONSTRUCTION SHALL CONFORM TO WEST VIRGINIA DEPARTMENT OF HEALTH AND HUMAN RESOURCES REGULATIONS.
30. ALL PIPELINE FITTINGS SHALL BE RESTRAINED AS SHOWN IN THE DETAILS.
31. PIPE JOINT DEFLECTION SHALL NOT EXCEED PIPE MANUFACTURER'S MAX. ALLOWABLE LIMITS.
32. A REPRESENTATIVE OF THE ENGINEER MUST BE PRESENT FOR ALL TESTING OF WATER AND SEWER MAINS.
33. ANY AND ALL VISIBLE LEAKAGE WILL BE REPAIRED BY METHODS DEEMED SUITABLE BY THE ENGINEER.
34. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED IN ACCORDANCE WITH WEST VIRGINIA DIVISION OF HIGHWAYS STANDARD SPECIFICATIONS, SECTION 652, SEEDING AND MULCHING, SEED MIX AS DIRECTED AS OWNER.
35. NO METALLIC UTILITY COMPONENTS/HARDWARE SHALL BE INSTALLED IN THE VICINITY OF COAL. IF COAL IS DISCOVERED IN UTILITY EXCAVATIONS, CONTACT THE ENGINEER.

LEGEND

EXISTING		PROPOSED	
	TREELINE		PROPERTY LINES
	EXISTING FENCE		RIP-RAP
	EXISTING STREAM OR DRAINAGE PATH	—W— W —	NEW WATER LINE
	EXISTING POWER POLE		NEW GATE VALVE W/ VALVE BOX
UE	EXISTING UNDERGROUND ELECTRIC		NEW CASING PIPE INSTALLATION
G	EXISTING GAS LINE	FIRE HYDRANT	NEW FIRE HYDRANT ASSEMBLY
GM	EXISTING GAS LINE MARKER		NEW BLOW-OFF ASSEMBLY
UT	EXISTING UNDERGROUND TELEPHONE		MANHOLE
W	EXISTING WATER LINE		DROP INLET
M	EXISTING WATER METER		HEAD WALL
	EXISTING WATER VALVE		POND RISER
FIRE HYDRANT	EXISTING FIRE HYDRANT	AV	AIR RELEASE VALVE
CO	EXISTING CLEAN OUT		SANITARY CLEANOUT
	EXISTING MANHOLE	T	WATER METER W/PRV (TANDEM)
	EXISTING HEAD WALL	BM	BENCH MARK

MAINTENANCE AND SEEDING NOTES

1. AT A MINIMUM, INSPECTIONS OF ALL EROSION AND SEDIMENT CONTROLS WILL BE CONDUCTED EVERY 7 DAYS AND WITHIN 24 HOURS OF A RAIN EVENT OF 0.5 INCHES OR GREATER OF RAINFALL IN 24 HOURS.
2. EXCEPT AS NOTED BELOW, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN SEVEN DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS PERMANENTLY CEASED.
3. WHERE THE INITIATION OF STABILIZATION MEASURES BY THE SEVENTH DAY AFTER CONSTRUCTION ACTIVITY TEMPORARILY OR PERMANENTLY CEASES IS PRECLUDED BY SNOW COVER, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS CONDITIONS ALLOW.
4. WHERE CONSTRUCTION ACTIVITY WILL RESUME ON A PORTION OF THE SITE WITHIN 14 DAYS FROM WHEN ACTIVITIES CEASED (e.g., THE TOTAL TIME PERIOD THAT CONSTRUCTION ACTIVITY IS TEMPORARILY HALTED IS LESS THAN 14 DAYS), THEN STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF THE SITE BY THE SEVENTH DAY AFTER CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED.
5. AREAS WHERE THE SEED HAS FAILED TO GERMINATE ADEQUATELY (UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70%) WITHIN 30 DAYS AFTER SEEDING AND MULCHING MUST BE RESEEDED IMMEDIATELY, OR AS SOON AS WEATHER CONDITIONS ALLOW.

SEDIMENT AND EROSION CONTROL NOTES

1. ALL SEDIMENT AND EROSION CONTROL MEASURES ARE SUBJECT TO INSPECTION AND CHANGES BY THE WVDEP OR ENGINEER.
2. LIMIT THE AMOUNT OF TOTAL DISTURBANCE ON SITE TO A MINIMUM. FINAL CONDITIONS ON SITE SHALL BE PREPARED AS A VEGETATED LAWN GRASS COVER MAINTAINED IN GOOD CONDITION UNTIL COMPLETION OF WORK.
3. ALL PAVED SURFACES (CONCRETE, ASPHALT, RIP-RAP, ETC.) SHALL BE INSTALLED AS SOON AS POSSIBLE UPON COMPLETION OF THE FINAL GRADING.
4. IN ORDER TO PREVENT AND TO PROVIDE FOR ABATEMENT AND CONTROL OF ANY ENVIRONMENTAL POLLUTION ARISING FROM THEIR CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS CONCERNING ENVIRONMENTAL POLLUTION CONTROL AND ABATEMENT, AS WELL AS SPECIFIC REQUIREMENTS AND CONDITIONS OF ANY NECESSARY PERMITS FOR CONSTRUCTION OBTAINED BY THE OWNER.
5. THE CONTRACTOR IS RESPONSIBLE TO KEEP A RECORD OF WHEN CONSTRUCTION ACTIVITIES HAVE BEGUN AND HAVE EITHER TEMPORARILY OR PERMANENTLY CEASED AND WHEN SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INITIATED, INSPECTED, MAINTAINED, AND REMOVED.
6. WASTE AREAS - THE CONTRACTOR WILL BE RESPONSIBLE FOR THE EROSION AND SEDIMENT CONTROLS AT EACH WASTE SITE INCLUDING, BUT NOT LIMITED TO, SILT FENCE, DIVERSION DITCHES, ROCK CHECK STRUCTURES, ETC. AS APPROPRIATE, AND THE RECLAMATION THEREOF ONCE CONSTRUCTION IS COMPLETE.
7. OTHER CONSTRUCTION PRACTICES - ANY WATER PUMPED FROM EXCAVATED AREAS SHALL NOT BE DISCHARGED DIRECTLY INTO ANY WATERCOURSE. ADEQUATE PROVISIONS MUST BE TAKEN TO PREVENT SEDIMENT AND EROSION FROM ENTERING THE WATERCOURSE.
8. NO MORE THAN 500 LF OF TRENCH MAY BE OPEN AT ANY GIVEN TIME.
9. OTHER CONSTRUCTION PRACTICES - ANY WATER PUMPED FROM EXCAVATED AREAS SHALL NOT BE DISCHARGED DIRECTLY INTO ANY WATERCOURSE. ADEQUATE PROVISIONS MUST BE TAKEN TO PREVENT SEDIMENT AND EROSION FROM ENTERING THE WATERCOURSE.
10. AREAS WHERE THE SEED HAS FAILED TO GERMINATE ADEQUATELY (UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70%) WITHIN 30 DAYS AFTER SEEDING AND MULCHING MUST BE RESEEDED IMMEDIATELY, OR AS SOON AS WEATHER CONDITIONS ALLOW.

GENERAL ENVIRONMENTAL NOTES

1. THE CONTRACTOR SHALL PROVIDE MEANS TO HANDLE SPILLS AND WASTE MATERIAL DISPOSAL. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:
   a. A CONTAINMENT DIKE SHALL BE PROVIDED AROUND ANY ON-SITE FUEL STORAGE TANKS. IT SHALL HAVE A CAPACITY OF 110% OF THE SIZE OF THE STORAGE TANK.
   b. ABSORBENT PADS SHALL BE AVAILABLE ON SITE FOR PETROLEUM SPILLS OR LEAKS ON GROUND. ABSORBENT BOOMS SHALL BE PROVIDED FOR SPILLS IN STREAMS.
   c. EXCESS CONCRETE SHALL NOT BE DISPOSED OF NEAR STREAMS.
2. THE CONTRACTOR SHALL REPORT ANY NONCOMPLIANCE WHICH MAY ENDANGER HEALTH OR THE ENVIRONMENT IMMEDIATELY AFTER BECOMING AWARE OF THE CIRCUMSTANCES BY CALLING THE DEPARTMENT OF ENVIRONMENTAL PROTECTION SPILL ALERT TELEPHONE NUMBER, 1-800-642-3074, AND ADVISING THE ENGINEER OF SUCH OCCURRENCE. CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A RECORD OF SUCH CALLS.
3. THE CONTRACTOR SHALL DEVELOP A SOIL MANAGEMENT PLAN (SMP) IN ACCORDANCE WITH SPECIFICATION SECTION 017500 - ENVIRONMENTAL CONTROL.

SEQUENCE OF EVENTS

1. CONTRACTOR IS RESPONSIBLE TO ESTABLISH A TIME SCHEDULE FOR EVENTS LISTED HERE FORWARD FOR CONTRACT START DATE.
2. INSTALL TEMPORARY SEDIMENT CONTROL STRUCTURES AS SHOWN ON PLAN BEFORE COMPLETION OF FIRST DAY.
3. BEGIN CLEARING AND GRUBBING.
4. ALL TEMPORARY EARTHWORK STOCKPILES EXPECTED TO BE LEFT OPEN FOR MORE THAN (7) DAYS SHALL BE TRACKED-IN AND TEMPORARILY SEEDED.
5. INSTALL PERMANENT STORM WATER CONTROL MEASURES.
6. INSPECT ALL SEDIMENT AND EROSION CONTROL DEVICES ON A REGULAR BASIS AND IMMEDIATELY FOLLOWING ANY RAINFALL.
7. PERFORM ALL NECESSARY MAINTENANCE SEDIMENT AND EROSION CONTROL DEVICES. REPAIR OR REPLACE ALL MATERIALS WHEN NECESSARY OR AS DIRECTED BY THE ENGINEER.
8. REFER TO PLANS FOR ANY PERMANENT SEEDING AND THE SPECIFICATIONS FOR SEEDING AND MULCHING SCHEDULES. ALL DISTURBED AREAS SHALL BE PERMANENTLY SEEDED WITHIN (7) DAYS OF COMPLETION OF FINAL GRADING.
9. REMOVE ALL TEMPORARY SEDIMENT AND EROSION CONTROL DEVICES UPON THE COMPLETION OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR WVDEP.

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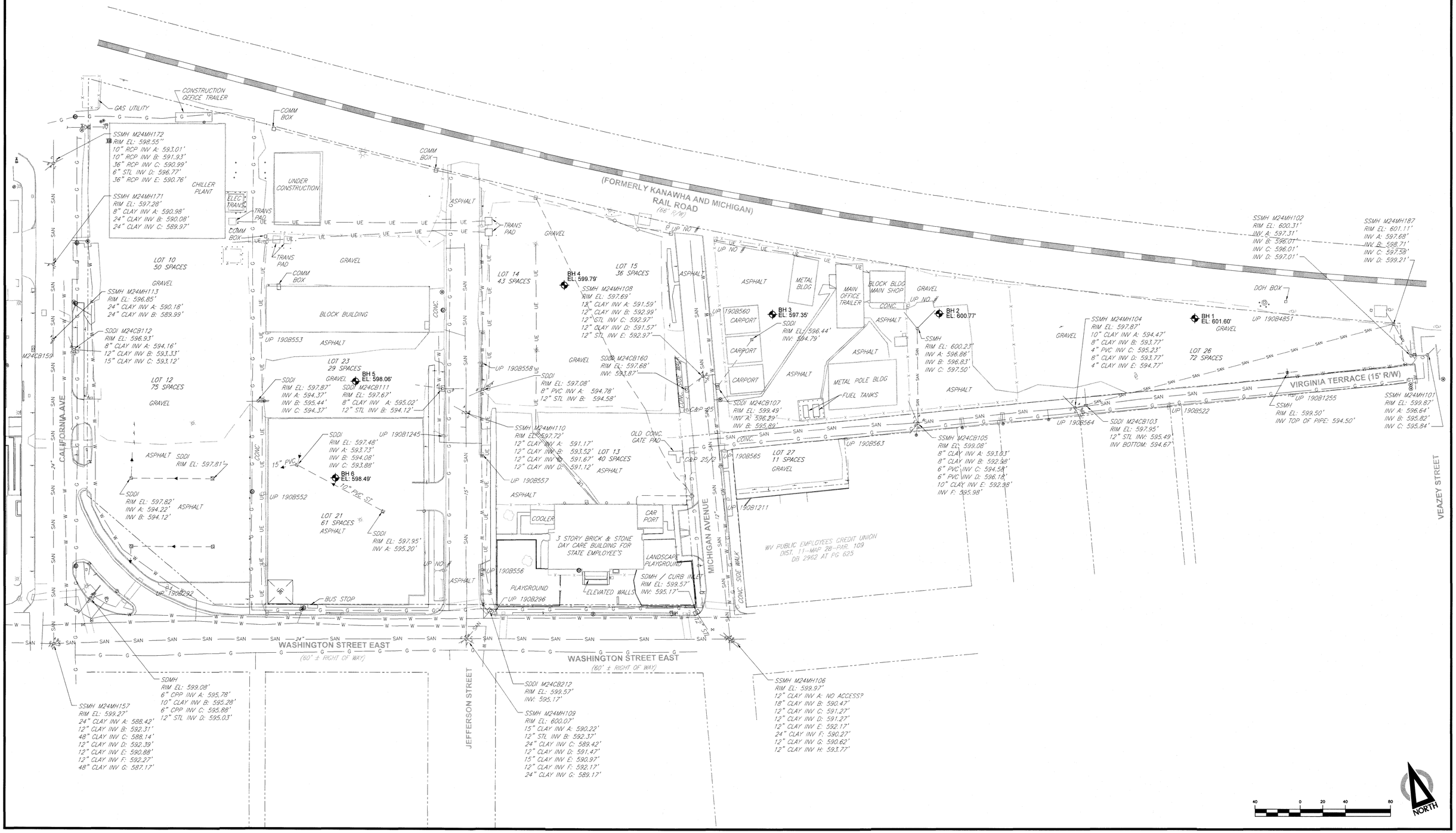
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GENERAL SITE NOTES

ROGER J. KENNEDY — No. 237 — PROFESSIONAL LANDSCAPE ARCHITECT — STATE OF WEST VIRGINIA — 8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KJW
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-001
REVISION	

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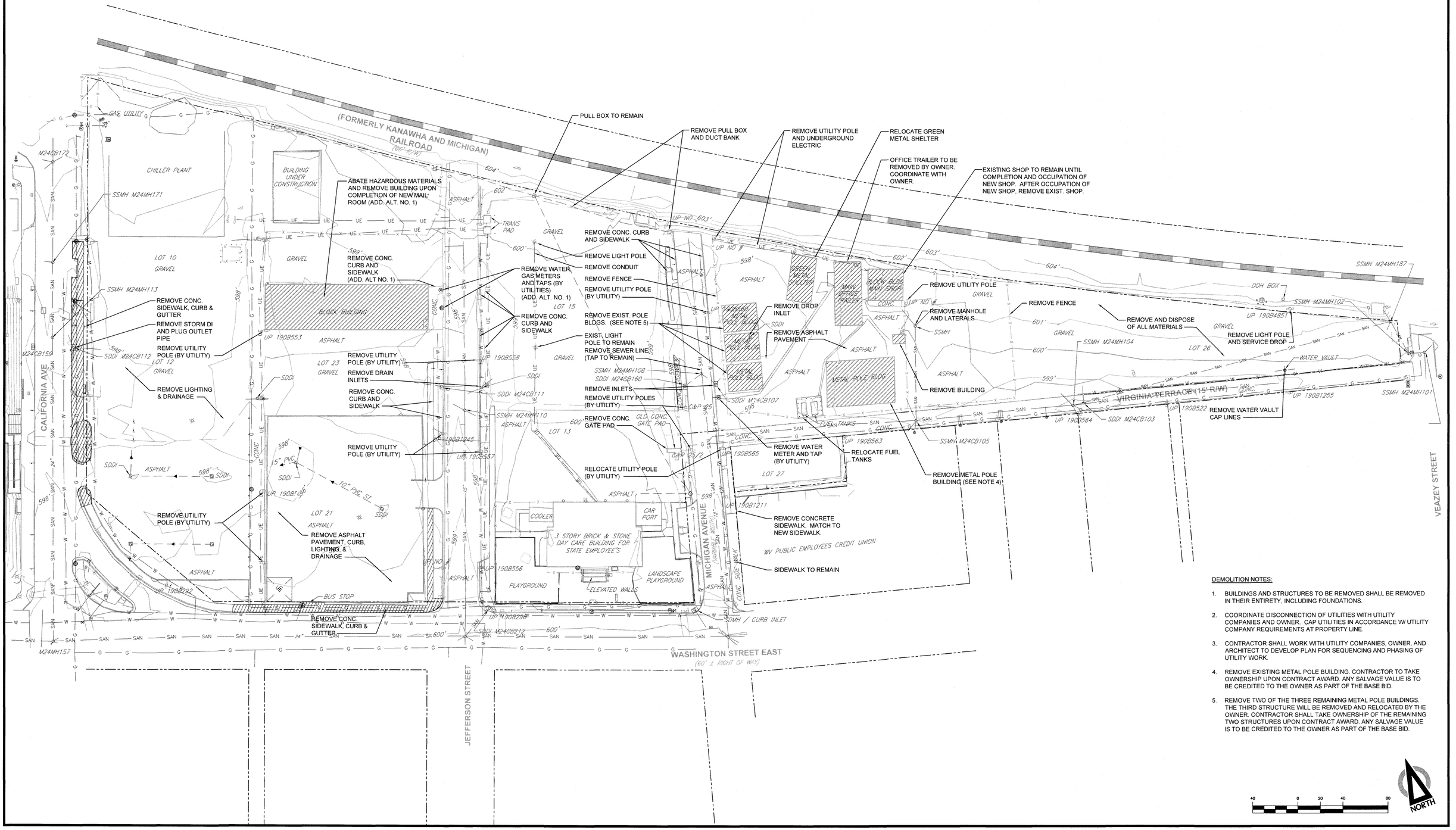
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

EXISTING SITE PLAN

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
5/6/21

JOB NUMBER:	19027
SCALE:	1" = 40'
DATE:	AUGUST 6, 2021
DRAWN BY:	FLB
DESIGNED BY:	PAW/RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-100	

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DEMOLITION NOTES:

1. BUILDINGS AND STRUCTURES TO BE REMOVED SHALL BE REMOVED IN THEIR ENTIRETY, INCLUDING FOUNDATIONS.
2. COORDINATE DISCONNECTION OF UTILITIES WITH UTILITY COMPANIES AND OWNER. CAP UTILITIES IN ACCORDANCE W/ UTILITY COMPANY REQUIREMENTS AT PROPERTY LINE.
3. CONTRACTOR SHALL WORK WITH UTILITY COMPANIES, OWNER, AND ARCHITECT TO DEVELOP PLAN FOR SEQUENCING AND PHASING OF UTILITY WORK.
4. REMOVE EXISTING METAL POLE BUILDING. CONTRACTOR TO TAKE OWNERSHIP UPON CONTRACT AWARD. ANY SALVAGE VALUE IS TO BE CREDITED TO THE OWNER AS PART OF THE BASE BID.
5. REMOVE TWO OF THE THREE REMAINING METAL POLE BUILDINGS. THE THIRD STRUCTURE WILL BE REMOVED AND RELOCATED BY THE OWNER. CONTRACTOR SHALL TAKE OWNERSHIP OF THE REMAINING TWO STRUCTURES UPON CONTRACT AWARD. ANY SALVAGE VALUE IS TO BE CREDITED TO THE OWNER AS PART OF THE BASE BID.

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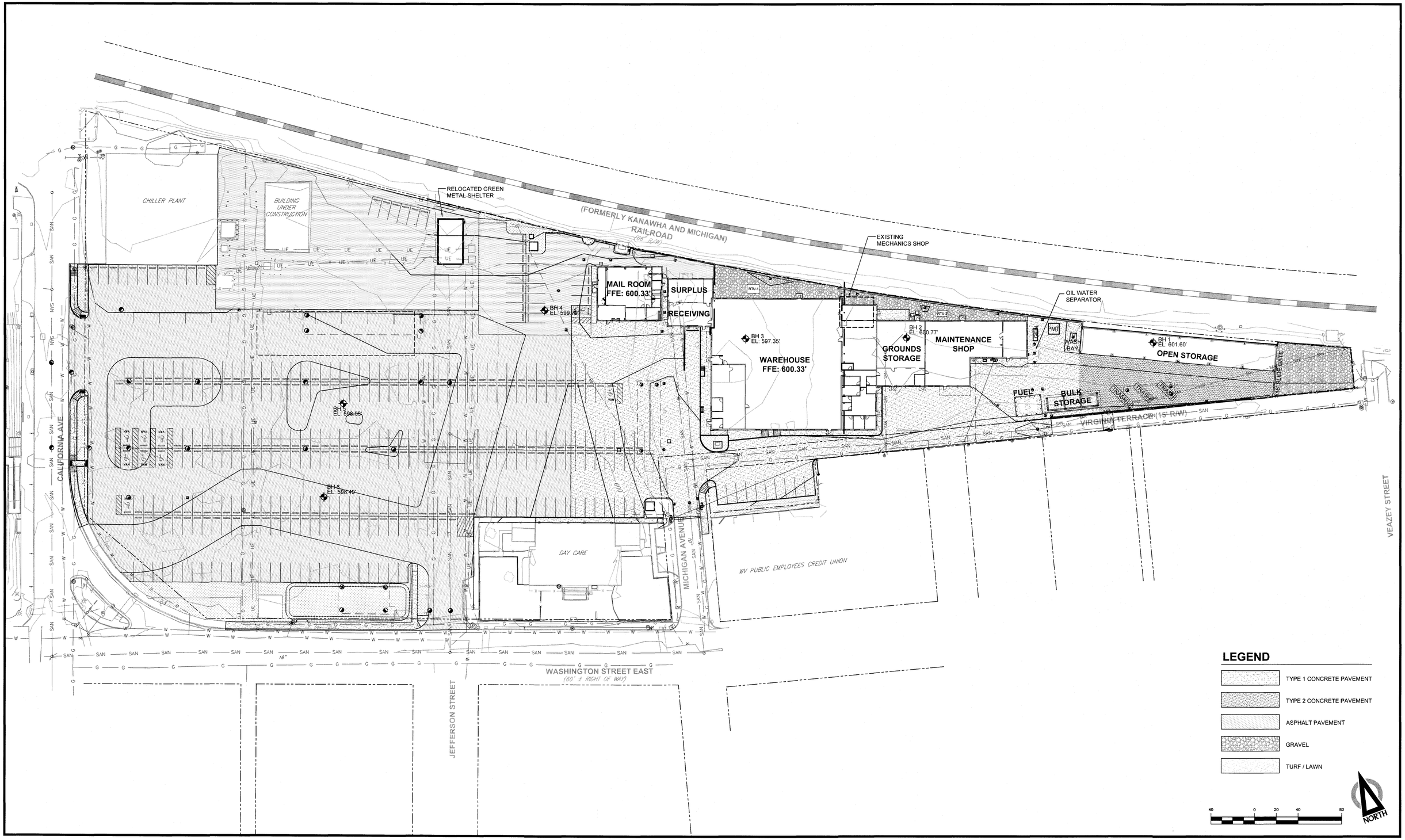
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE DEMOLITION PLAN

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 837
STATE OF WEST VIRGINIA
5/6/21

JOB NUMBER:	19027
SCALE:	1" = 40'
DATE:	AUGUST 6, 2021
DRAWN BY:	FLB
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-101
REVISION	

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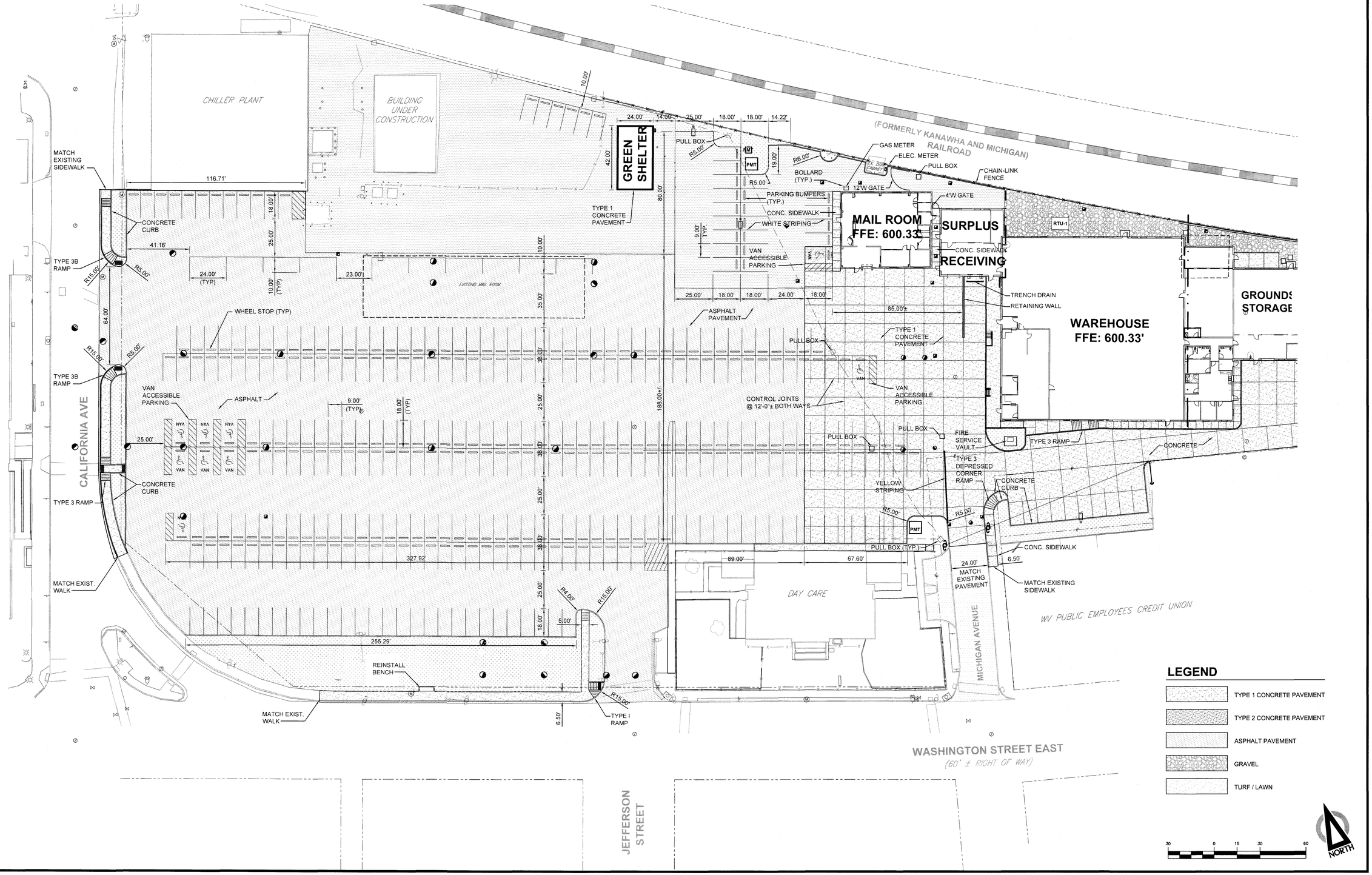
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

OVERALL PROPOSED SITE PLAN

PROFESSIONAL LANDSCAPE ARCHITECT ROGER J. KENNEDY No. 237 STATE OF WEST VIRGINIA
8/6/21

JOB NUMBER:	19027
SCALE:	1" = 40'
DATE:	AUGUST 6, 2021
DRAWN BY:	FLB
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
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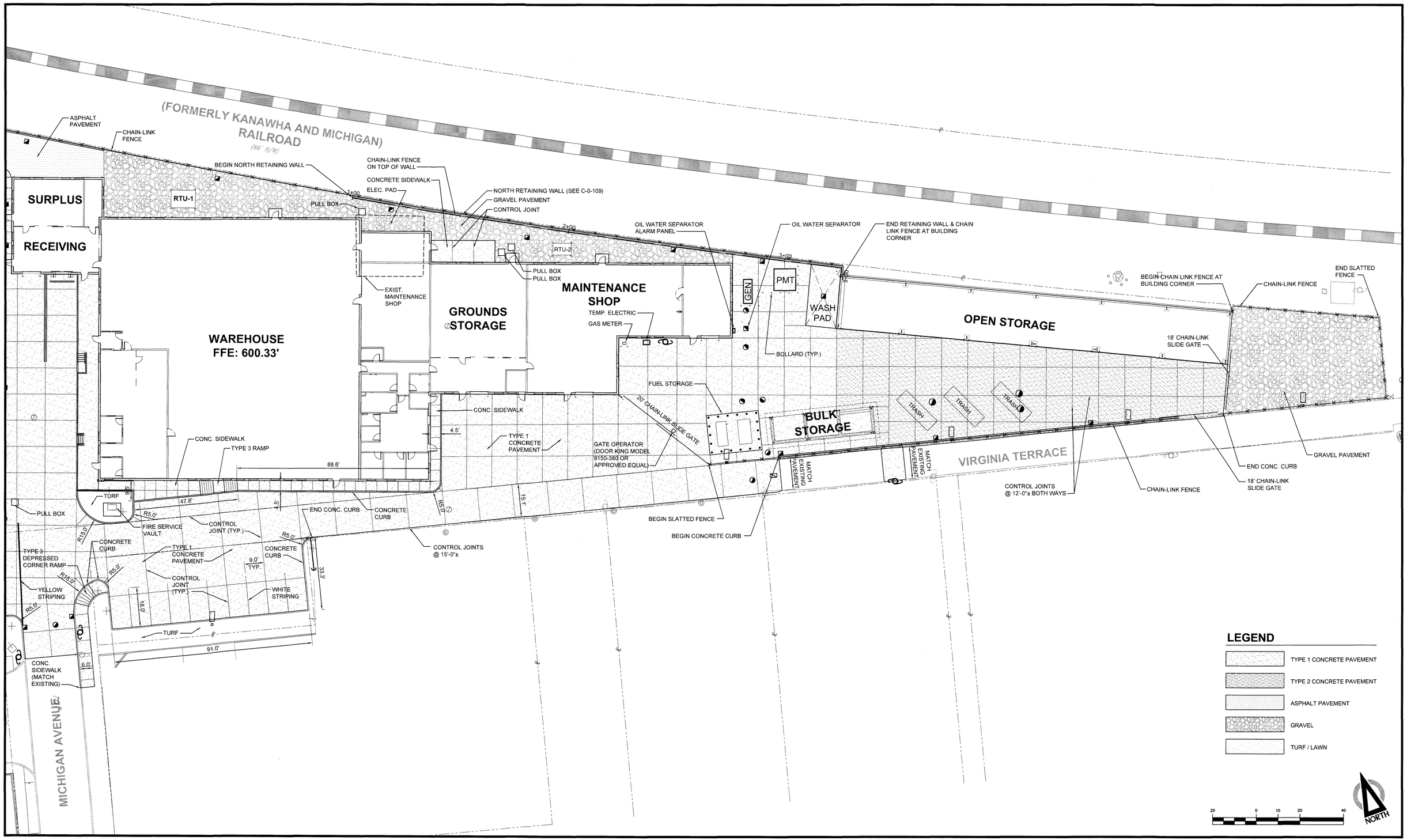
PROJECT INFORMATION
West Virginia Department of Administration
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Capitol East Campus
Charleston, West Virginia

SITE LAYOUT AND MATERIALS PLAN - WEST

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 467
STATE OF WEST VIRGINIA
8/4/21

JOB NUMBER:	19027
SCALE:	1" = 30'
DATE:	AUGUST 6, 2021
DRAWN BY:	CTG
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-103	

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PROJECT INFORMATION
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SITE LAYOUT AND MATERIALS PLAN - EAST

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 231
STATE OF WEST VIRGINIA
9/6/21

JOB NUMBER:	19027
SCALE:	1" = 20'
DATE:	AUGUST 6, 2021
DRAWN BY:	CTG
DESIGNED BY:	RJK
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SHEET NO.	C-0-104
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DRAINAGE INFORMATION

MH 2-1
TOP EL: 597.96'
INV. IN: 591.26' (DI 2-2)
INV. IN: 591.26' (DI 2-1-1)

DI 2-1-1
TOP EL: 597.71'
INV. OUT: 591.34'

DI 2-2
TOP EL: 598.00'
INV. IN: 591.50'
INV. OUT: 591.40'

DI 2-3
TOP EL: 597.65'
INV. IN: 592.11'
INV. OUT: 592.01'

MH 2-4
TOP EL: 597.63'
INV. IN: 592.57'
INV. OUT: 592.47'

DI 2-5
TOP EL: 600.00'
INV. IN: 592.96' (MH 2-6)
INV. IN: 592.96' (TRENCH DRAIN)
INV. IN: 597.00' (DI 2-5-1)
INV. OUT: 592.86'

DI 2-6
TOP EL: 599.76'
INV. IN: 593.59'
INV. OUT: 593.49'

DI 2-7
TOP EL: 599.33'
INV. IN: 593.91'
INV. OUT: 593.81'

DI 2-8
TOP EL: 599.85'
INV. IN: 594.23'
INV. OUT: 594.13'

DI 2-9
TOP EL: 600.00'
INV. IN: 594.48'
INV. OUT: 594.38'

MH 3-1
TOP EL: 597.87'
INV. IN: 591.60'

MH 3-2
TOP EL: 597.20'
INV. IN: 591.96' (MH 3-3)
INV. IN: 591.96' (MH 3-2-1)
INV. OUT: 591.86'

MH 3-3
TOP EL: 598.70'
INV. IN: 592.57'
INV. OUT: 592.47'

MH 3-4
TOP EL: 599.10'
INV. OUT: 592.71'

M24MH113
TOP EL: 596.85'
INV. IN: 591.65'

DI 4-1
TOP EL: 597.34'
INV. IN: 592.06'
INV. OUT: 591.96'

MH 4-2
TOP EL: 596.52'
INV. IN: 593.30' (MH 4-3)
INV. IN: 592.96' (MH 4-2-1)
INV. OUT: 592.86'

MH 4-3
TOP EL: 598.00'
INV. IN: 594.44'
INV. OUT: 594.34'

DI 4-4
TOP EL: 597.80'
INV. OUT: 595.30'

MH 5-1
TOP EL: 599.51'
INV. IN: 590.74'

MH 5-2
TOP EL: 598.96'
INV. IN: 591.03'
INV. OUT: 590.93'

MH 5-3
TOP EL: 598.00'
INV. IN: 591.44'
INV. OUT: 591.34'

MH 5-4
TOP EL: 598.00'
INV. IN: 591.65'
INV. OUT: 591.55'

MH 5-5
TOP EL: 596.85'
INV. IN: 593.08'
INV. OUT: 592.98'

MH 5-6
TOP EL: 597.15'
INV. OUT: 593.89'

MH 6-1
TOP EL: 597.43'
INV. IN: 591.62'

MH 6-2
TOP EL: 597.72'
INV. IN: 592.06'
INV. OUT: 591.96'

MH 6-3
TOP EL: 596.60'
INV. IN: 592.53' (MH 6-4)
INV. IN: 592.53' (MH 6-3-1)
INV. OUT: 592.43'

MH 6-4
TOP EL: 597.16'
INV. IN: 592.53'
INV. OUT: 593.07'

NOTE:
FOLLOW GRIT/GAS TRAP DETAIL FOR STORM STRUCTURES MH 4-2, MH 5-2, AND MH 6-2. SEE SHEET C-0-507 FOR DETAIL.

REVISION NUMBER	REVISIONS	DATE	BY

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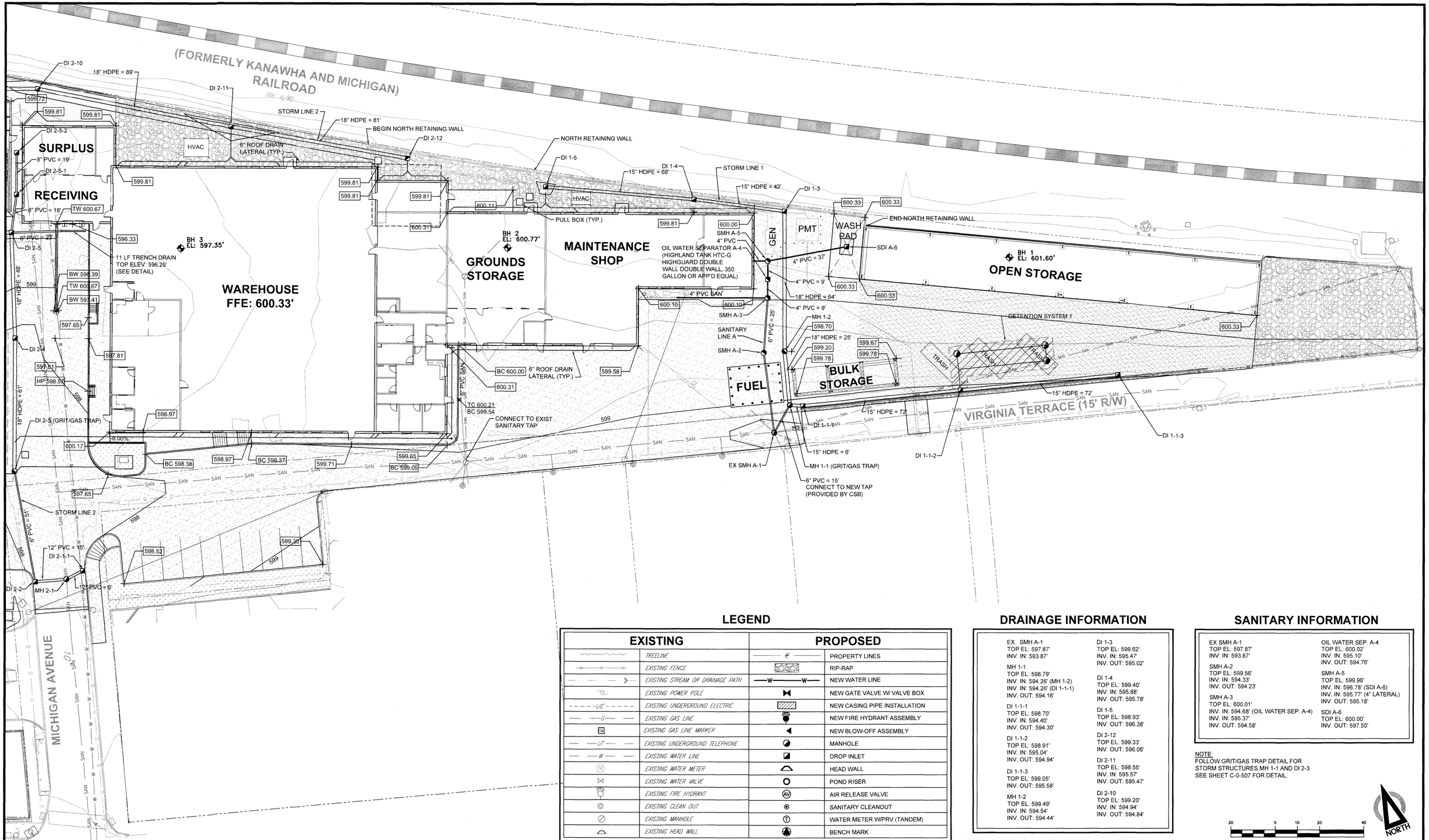
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

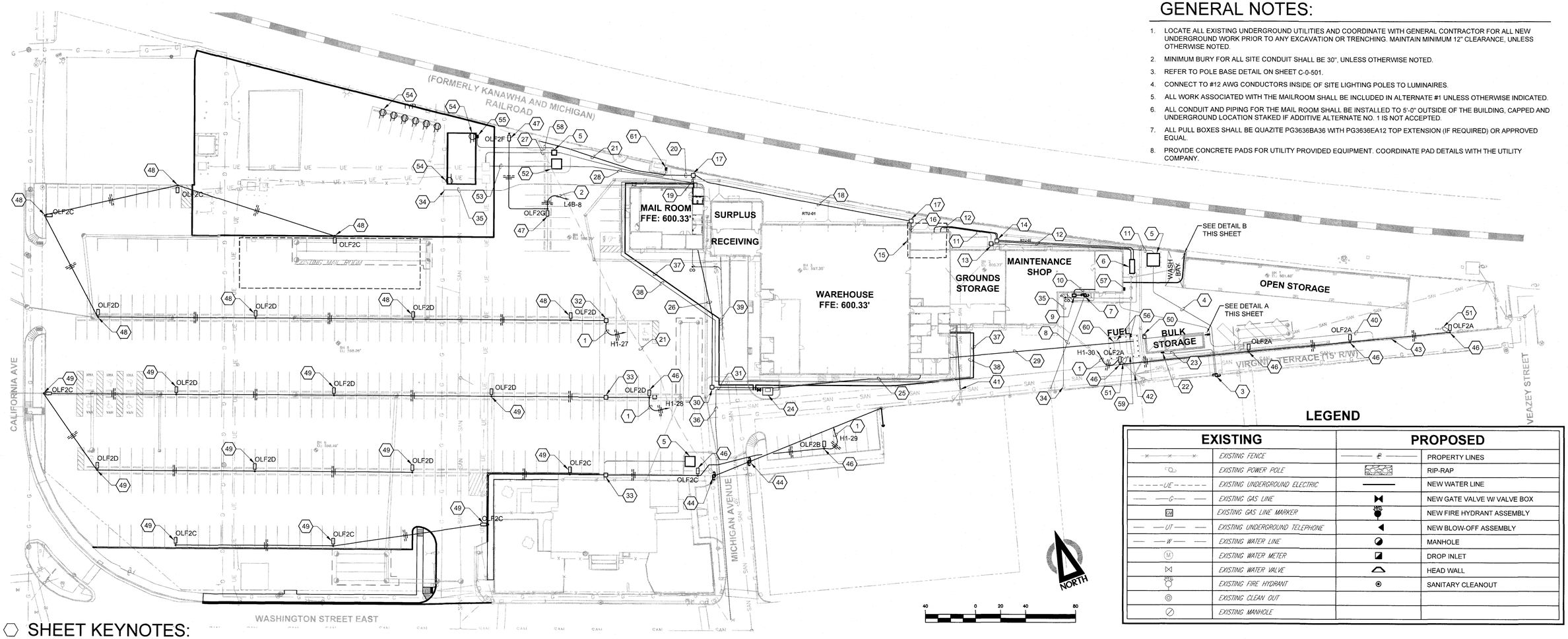
SITE GRADING AND DRAINAGE PLAN - WEST

PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 231
STATE OF WEST VIRGINIA
6/6/21

JOB NUMBER:	19027
SCALE:	1" = 30'
DATE:	AUGUST 6, 2021
DRAWN BY:	FLB
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-105
REVISION	△

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(FORMERLY KANAWHA AND MICHIGAN) RAILROAD
SURPLUS
RECEIVING
WAREHOUSE
FFE: 600.33'
GROUNDS STORAGE
MAINTENANCE SHOP
HVAC
PULL BOX (TYP.)
GEN
PMT
WASH PAD
FUEL
BULK STORAGE
OPEN STORAGE
DETENTION SYSTEM 1
TRASH
VIRGINIA TERRACE (15' R/W)
MICHIGAN AVENUE
BH 1 EL: 601.60'
BH 2 EL: 600.77'
BH 3 EL: 597.35'
OIL WATER SEPARATOR A-4 (HIGHLAND TANK HTC-G HIGHGUARD DOUBLE WALL DOUBLE WALL, 350 GALLON OR APP'D EQUAL)
11 LF TRENCH DRAIN TOP ELEV. 596.25' (SEE DETAIL)
6" ROOF DRAIN LATERAL (TYP.)
CONNECT TO EXIST SANITARY TAP
TC 600.21
BC 599.54
EX SMH A-1
MH 1-1 (GRIT/GAS TRAP)
6" PVC = 15' CONNECT TO NEW TAP (PROVIDED BY CSB)
END NORTH RETAINING WALL
NORTH RETAINING WALL
BEGIN NORTH RETAINING WALL
STORM LINE 1
STORM LINE 2
SANITARY LINE A
DI 2-10
DI 2-11
DI 2-12
DI 1-1-1
DI 1-1-2
DI 1-1-3
DI 1-3
DI 1-4
DI 1-5
DI 2-1-1
DI 2-2
DI 2-3 (GRIT/GAS TRAP)
DI 2-4
DI 2-5
DI 2-5-1
DI 2-5-2
MH 1-2
MH 2-1
SMH A-2
SMH A-3
SMH A-5
SDI A-6
18" HDPE = 89'
18" HDPE = 81'
18" HDPE = 64'
18" HDPE = 48'
18" HDPE = 61'
15" HDPE = 68'
15" HDPE = 42'
15" HDPE = 72'
15" HDPE = 6'
12" PVC = 15'
8" PVC = 19'
8" PVC = 18'
8" PVC = 23'
6" PVC = 25'
6" PVC = 51'
4" PVC = 37'
4" PVC = 9'
4" PVC SAN
8.00%
599.72
599.81
599.81
599.81
599.81
599.81
600.11
600.31
599.81
600.00
600.33
600.33
600.33
600.33
600.33
600.10
600.10
598.70
599.67
599.78
599.20
599.78
599.58
600.31
BC 600.00
596.33
597.65
597.81
597.81
598.52
598.97
600.17
BC 598.38
598.97
BC 598.37
599.71
599.65
BC 599.05
597.65
598.52
599.30
599
598
599
598
599
598



GENERAL NOTES:

1. LOCATE ALL EXISTING UNDERGROUND UTILITIES AND COORDINATE WITH GENERAL CONTRACTOR FOR ALL NEW UNDERGROUND WORK PRIOR TO ANY EXCAVATION OR TRENCHING. MAINTAIN MINIMUM 12" CLEARANCE, UNLESS OTHERWISE NOTED.
2. MINIMUM BURY FOR ALL SITE CONDUIT SHALL BE 30", UNLESS OTHERWISE NOTED.
3. REFER TO POLE BASE DETAIL ON SHEET C-0-501.
4. CONNECT TO #12 AWG CONDUCTORS INSIDE OF SITE LIGHTING POLES TO LUMINAIRES.
5. ALL WORK ASSOCIATED WITH THE MAILROOM SHALL BE INCLUDED IN ALTERNATE #1 UNLESS OTHERWISE INDICATED.
6. ALL CONDUIT AND PIPING FOR THE MAIL ROOM SHALL BE INSTALLED TO 5'-0" OUTSIDE OF THE BUILDING, CAPPED AND UNDERGROUND LOCATION STAKED IF ADDITIVE ALTERNATE NO. 1 IS NOT ACCEPTED.
7. ALL PULL BOXES SHALL BE QUAZITE PG3636BA36 WITH PG3636EA12 TOP EXTENSION (IF REQUIRED) OR APPROVED EQUAL.
8. PROVIDE CONCRETE PADS FOR UTILITY PROVIDED EQUIPMENT. COORDINATE PAD DETAILS WITH THE UTILITY COMPANY.

LEGEND

EXISTING		PROPOSED	
-x-x-x-	EXISTING FENCE	—— ℄ ——	PROPERTY LINES
	EXISTING POWER POLE		RIP-RAP
---UE---	EXISTING UNDERGROUND ELECTRIC	——	NEW WATER LINE
——G——	EXISTING GAS LINE		NEW GATE VALVE W/ VALVE BOX
GM	EXISTING GAS LINE MARKER		NEW FIRE HYDRANT ASSEMBLY
——UT——	EXISTING UNDERGROUND TELEPHONE		NEW BLOW-OFF ASSEMBLY
——W——	EXISTING WATER LINE		MANHOLE
M	EXISTING WATER METER		DROP INLET
	EXISTING WATER VALVE		HEAD WALL
	EXISTING FIRE HYDRANT		SANITARY CLEANOUT
	EXISTING CLEAN OUT		
	EXISTING MANHOLE		

SHEET KEYNOTES:

1. ROUTE INDICATED EXTERIOR LIGHTING CIRCUIT VIA EXTERIOR LIGHTING CONTACTOR, REFER TO DETAIL ON E-501. SEE PANEL SCHEDULE FOR REQUIRED CONDUIT/CONDUCTORS.
2. ROUTE INDICATED EXTERIOR LIGHTING CIRCUIT VIA EXTERIOR LIGHTING CONTACTOR, REFER TO DETAIL ON E-500. SEE PANEL SCHEDULE FOR REQUIRED CONDUIT/CONDUCTORS. CIRCUIT SHALL BE INCLUDED IN ALTERNATE #1.
3. NEW UTILITY SERVICE POLE. COORDINATE WITH AMERICAN ELECTRIC POWER.
4. UNDERGROUND PRIMARY ELECTRIC SERVICE FROM NEW UTILITY POLE.
5. NEW UTILITY-OWNED, PAD-MOUNT, TRANSFORMER (SIZE BY AMERICAN ELECTRIC POWER)
6. NEW NATURAL GAS FIRED GENERATOR. REFER TO ELECTRICAL RISER ON E-1-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
7. TEMPORARY SERVICE DROP POLE AND POLE MOUNTED TRANSFORMER FOR GROUND MECHANICS SHOP (GMS). POLE AND TRANSFORMER SHALL BE REMOVED AFTER GMS SERVICE IS MOVED TO MAIN BUILDING SERVICE.
8. TEMPORARY OVERHEAD PRIMARY SERVICE FOR GROUND MECHANICS SHOP (GMS). SERVICE SHALL BE REMOVED AFTER GMS. SERVICE SHALL BE REMOVED AFTER GMS SERVICE IS MOVED TO MAIN BUILDING SERVICE.
9. TEMPORARY CT CABINET FOR GROUND MECHANICS SHOP (GMS). CABINET SHALL BE REMOVED AFTER GMS SERVICE IS MOVED TO MAIN BUILDING SERVICE.
10. TEMPORARY SECONDARY ELECTRICAL SERVICE FOR GROUNDS MECHANICS SHOP (GMS). CONDUCTORS SHALL BE REMOVED AND CONDUIT SHALL BE CAPPED AFTER GMS SERVICE IS MOVED TO MAIN BUILDING SERVICE.
11. WAREHOUSE/GROUNDS BUILDING SECONDARY ELECTRICAL SERVICE. REFER TO E-1-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
12. GENERATOR CONNECTIONS. REFER TO E-1-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
13. INGROUND PULL BOX FOR SECONDARY ELECTRICAL SERVICE.
14. INGROUND PULL BOX FOR GENERATOR CONNECTIONS.
15. LOCATION OF EXISTING GROUNDS MECHANIC SHOP (GMS). NO WORK SHALL BE PERFORMED IN THIS AREA UNTIL NEW PHASE 1A GMS IS COMPLETED AND OPERATIONAL.
16. PROVIDE TWO (2) 2" CONDUITS UNDERGROUND FOR FIBER SERVICE. REFER TO E-1-106 FOR CONTINUATION INTO THE BUILDING.
17. INGROUND PULL BOX FOR FIBER SERVICE.
18. PROVIDE TWO (2) 2" CONDUITS UNDERGROUND FOR FIBER SERVICE. REFER TO E-1-106 FOR CONTINUATION.
19. PROVIDE ONE (1) 2" CONDUIT UNDERGROUND FOR FIBER SERVICE AS PART OF ALTERNATE #1. REFER TO E-3-103 FOR CONTINUATION.
20. PROVIDE THREE (3) 2" CONDUIT UNDERGROUND FOR FIBER SERVICE. CONDUITS SHALL BE CONNECTED TO EXISTING SPARE CONDUITS FOR FIBER CONNECTIONS TO CAMPUS NETWORK.
21. EIGHT (8) 2" UNDERGROUND CONDUITS FOR FUTURE CONNECTIONS TO FIBER SERVICE. CONDUITS INSTALLED UNDER PREVIOUS CONSTRUCTION CONTRACT.
22. BULK STORAGE BUILDING SERVICE PANEL.
23. PROVIDE SECONDARY ELECTRICAL SERVICE UNDERGROUND FROM POLE MOUNTED TRANSFORMER TO BULK STORAGE BUILDING SERVICE PANEL. REFER TO RISER ON E-2-100 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
24. FIRE PROTECTION VAULT. CONNECT 1-1/2" SUMP DISCHARGE TO DI 2-2. SEE SHEET C-0-105.
25. PROVIDE UNDERGROUND 1" CONDUIT FROM FIRE VAULT TO WAREHOUSE/GROUNDS FIRE ALARM CONTROL PANEL. REFER TO E-1-106 FOR CONTINUATION.
26. PROVIDE UNDERGROUND 1" CONDUIT FROM FIRE VAULT TO MAILROOM FIRE ALARM CONTROL PANEL, IN ALTERNATE #1. REFER TO E-3-103 FOR CONTINUATION.
27. UNDERGROUND PRIMARY ELECTRIC SERVICE FROM EXISTING SECTIONALIZING CABINET.
28. MAILROOM SECONDARY ELECTRICAL SERVICE INCLUDED IN ALTERNATE #1. REFER TO E-3-900 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
29. PROVIDE POWER AND CONTROL CONDUITS FOR FUEL SYSTEMS. REFER TO E-1-104 & E-1-106 FOR CONTINUATION AND ADDITIONAL REQUIREMENTS.
30. PROVIDE PULL BOX FOR MAILROOM FIRE ALARM CONNECTIONS IN BASE BID. PULL BOX SHALL NOT BE INSTALLED IF ALTERNATE #1 IS ACCEPTED.
31. CONDUIT FROM FIRE VAULT TO PULL BOX SHALL BE INCLUDED IN BASE BID.
32. PROVIDE PULL BOX AND UNDERGROUND CONDUIT TO PANEL IN BASE BID, PULL BOX NOT REQUIRED IS ALTERNATE #2 IS ACCEPTED.
33. PROVIDE PULL BOX AND CONDUIT UNDERGROUND TO PANEL IN BASE BID, PULL BOX NOT REQUIRED IF ALTERNATE #3 IS ACCEPTED.
34. NATURAL GAS SERVICE CONNECTION BY MOUNTAINEER GAS CO.
35. INSTALL GAS LINE AND RISERS - 3"Ø FOR THE WAREHOUSE AND 1-1/4"Ø FOR THE MAIL ROOM
36. NEW WATER MAIN INSTALLED BY WV AMERICAN WATER CO..
37. PROVIDE 2" PE DOMESTIC WATERLINE.
38. PROVIDE 6" PE FIRE PROTECTION WATERLINE.
39. INSTALL 4" PVC SANITARY SEWER. CONNECT TO EXISTING TAP.
40. INSTALL 2" PE TEMPORARY WATER SERVICE.
41. INSTALL 6" PVC SANITARY SEWER. CONNECT TO EXISTING TAP.
42. INSTALL 6" PVC SANITARY SEWER. CONNECT TO NEW TAP. TAP INSTALLED BY CHARLESTON SANITARY BOARD.
43. NEW TAP BY WV AMERICAN WATER CO.
44. EXISTING UTILITY POLE.
45. INSTALL MURDOCK M-3909 GROUND HYDRANT OR APPROVED EQUAL.
46. PROVIDE LIGHT FIXTURE AS PART OF BASE BID.
47. PROVIDE LIGHT FIXTURE AS PART OF ALTERNATE #1.
48. PROVIDE LIGHT FIXTURE AS PART OF ALTERNATE #2.
49. PROVIDE LIGHT FIXTURE AS PART OF ALTERNATE #3.
50. WEATHERPROOF, EMERGENCY SHUT OFF FOR FUEL SYSTEM.
51. GSD AGENCY CAMERA. PROVIDE SECURITY CAMERA 16'-0" AFG MOUNT SITE LIGHT POLE. REFER TO CAMERA RISER ON E-1-903.
52. NEW UTILITY-OWNED, PAD-MOUNT, TRANSFORMER (SIZE BY AMERICAN ELECTRIC POWER) INCLUDED IN ALTERNATE #1.
53. UNDERGROUND PRIMARY ELECTRIC SERVICE FROM EXISTING SECTIONALIZING CABINET INCLUDED IN ALTERNATE #1.
54. PROVIDE PEDESTAL MOUNTED WEATHERPROOF RECEPTACLE FOR VEHICLE BLOCK HEATER. SEE EQUIPMENT SUPPORT BRACKET DETAIL SHEET E-502.
55. PROVIDE PANEL L5. IN NEMA 3R ENCLOSURE WITH METERBASE, EQUIPMENT SHALL BE MOUNTED ON GROUND MOUNTED FREE STANDING SUPPORT RACK AT VEHICLE SHELTER.
56. PROVIDE WIRING FROM FUEL PUMPS VIA EMERGENCY SHUT OFF BUTTON TO PANEL L3.
57. OIL WATER SEPARATOR ALARM PANEL.
58. PROVIDE 3#8 IN 1" CONDUIT FROM GROUND MOUNTED TRANSFORMER TO VEHICLE STORAGE PANEL. SERVICE ENTRANCE AND CONDUIT PER AEP REQUIREMENTS.
59. PROVIDE 1/2" GROUND ROD FOR FUEL SYSTEM LIGHTNING PROTECTION SYSTEM.
60. RELOCATED FUEL TANKS - THE AREA WITHIN THE DISPENSING AREA SHALL BE CLASSIFIED AS CLASS I, DIVISION 1 AND THE AREA WITHIN 20 FEET OF ANY EDGE OF THE TANKS AND 18 INCHES ABOVE GRADE SHALL BE CLASSIFIED AS CLASS I, DIVISION 2. ANY EQUIPMENT WITHIN THE CLASSIFIED AREA SHALL BE UL LISTED FOR THAT AREA. ALL WIRING METHODS SHALL CONFORM TO THE REQUIREMENTS OF NEC ARTICLES 500, 501, AND 514. ALL CONDUITS ENTERING/EXITING THE HAZARDOUS AREA SHALL HAVE SEALING FITTINGS BEFORE CROSSING THE AREA BOUNDARY.
61. NEW ELECTRICAL SERVICE FOR WVDOH OWNED LIGHT. INSTALL COMBINATION METER BASE, CONNECT TO EXISTING PANEL. SERVICE ENTRANCE AND CONDUIT PER AEP REQUIREMENTS.

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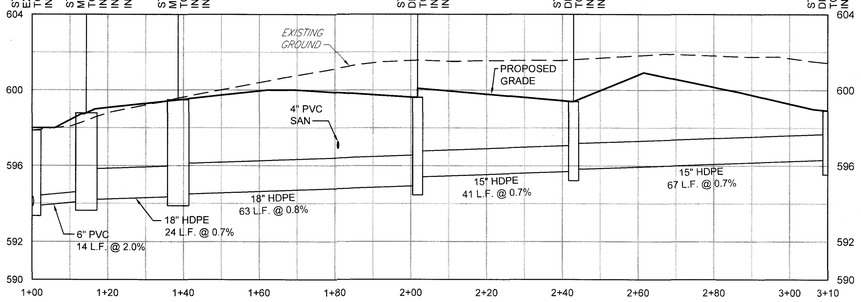
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE UTILITY PLAN

PROFESSIONAL LANDSCAPE ARCHITECT — ROGER J. KENNEDY — No. 237 — STATE OF WEST VIRGINIA — 3/6/21

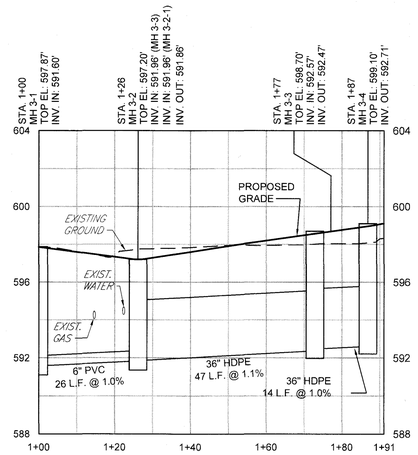
JOB NUMBER:	19027
SCALE:	1" = 40'
DATE:	AUGUST 6, 2021
DRAWN BY:	RJK/KGM
DESIGNED BY:	RJK/KGM
CHECKED BY:	JEB
SHEET NO.	C-0-107
REVISION	△

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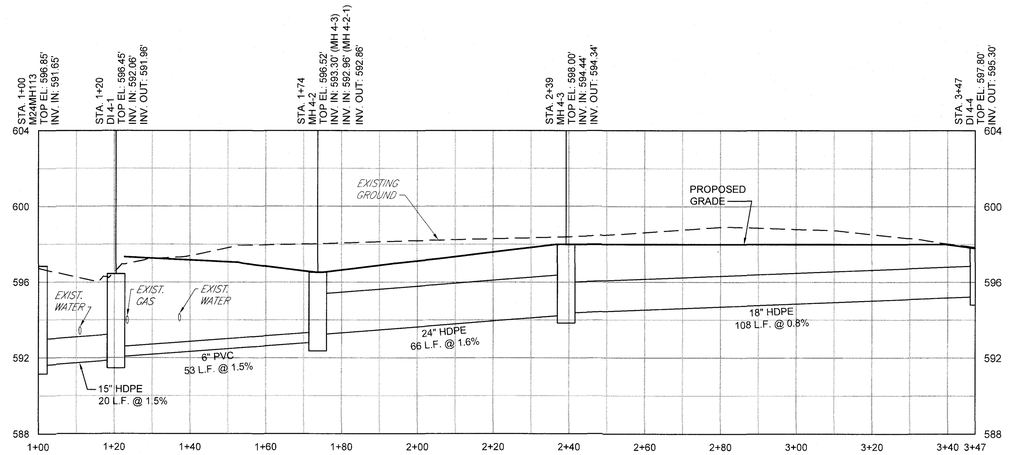
STORM LINE 1 - 1+00 TO 3+10

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



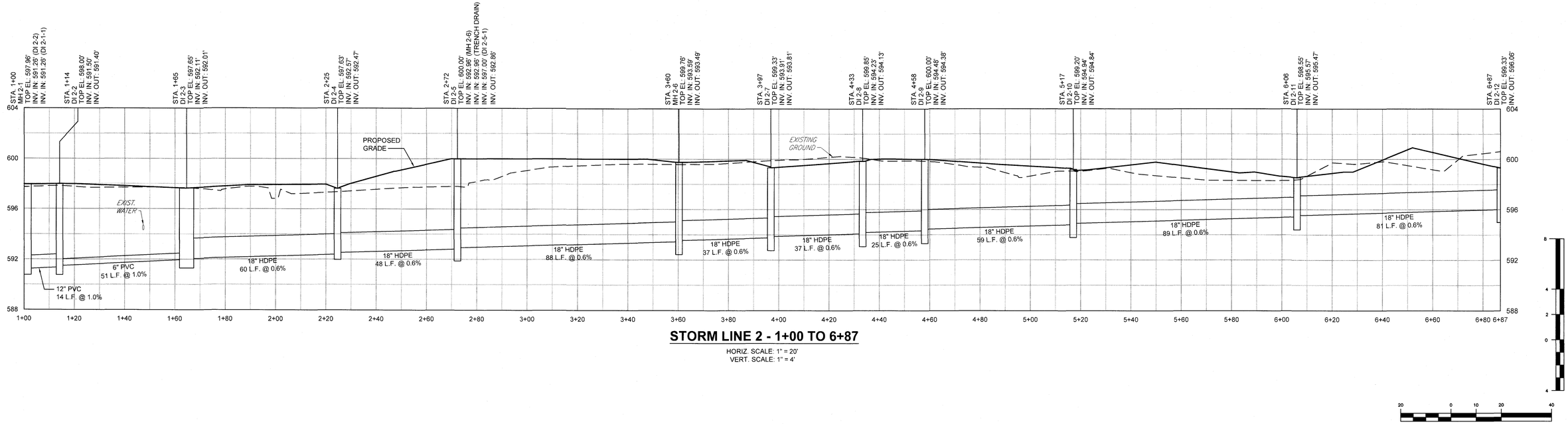
STORM LINE 3 - 1+00 TO 1+91

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



STORM LINE 4 - 1+00 TO 3+47

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



STORM LINE 2 - 1+00 TO 6+87

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'

REVISION NUMBER	REVISIONS	DATE	BY

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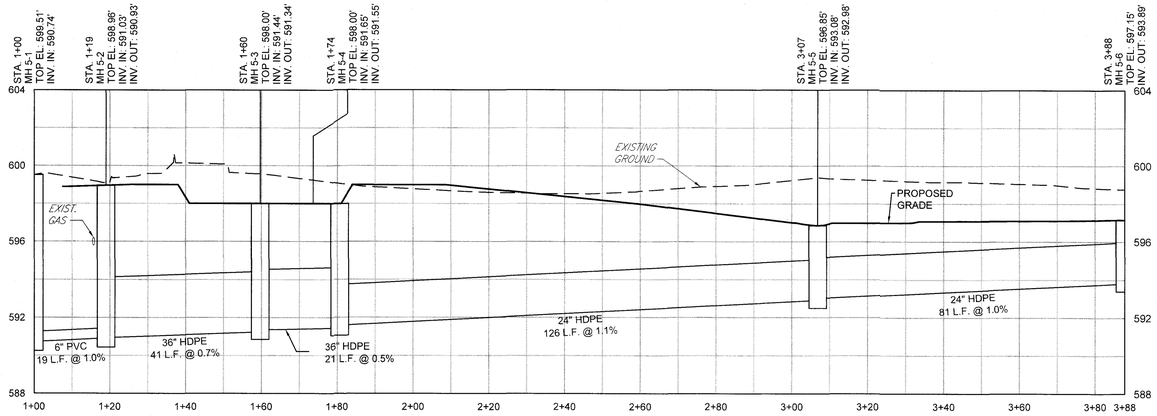
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

STORM LINE PROFILES

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 227
STATE OF WEST VIRGINIA
6/6/21

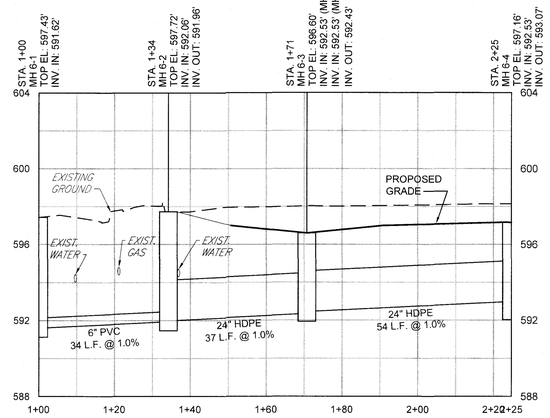
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	RJK/FLB
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-108	

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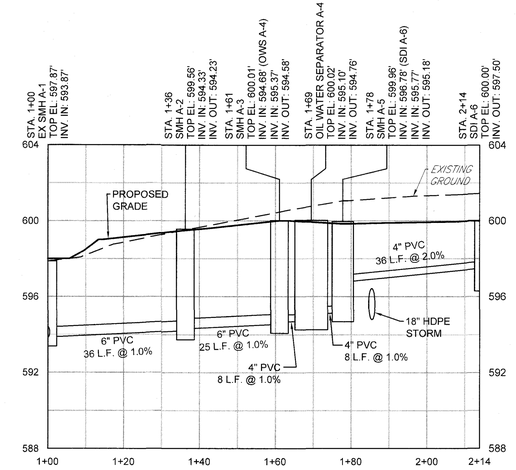
STORM LINE 5 - 1+00 TO 3+88

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



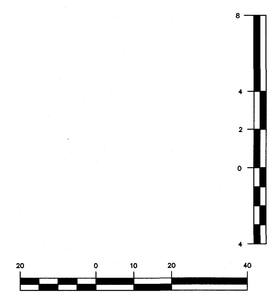
STORM LINE 6 - 1+00 TO 2+25

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



SANITARY LINE A - 1+00 TO 2+14

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



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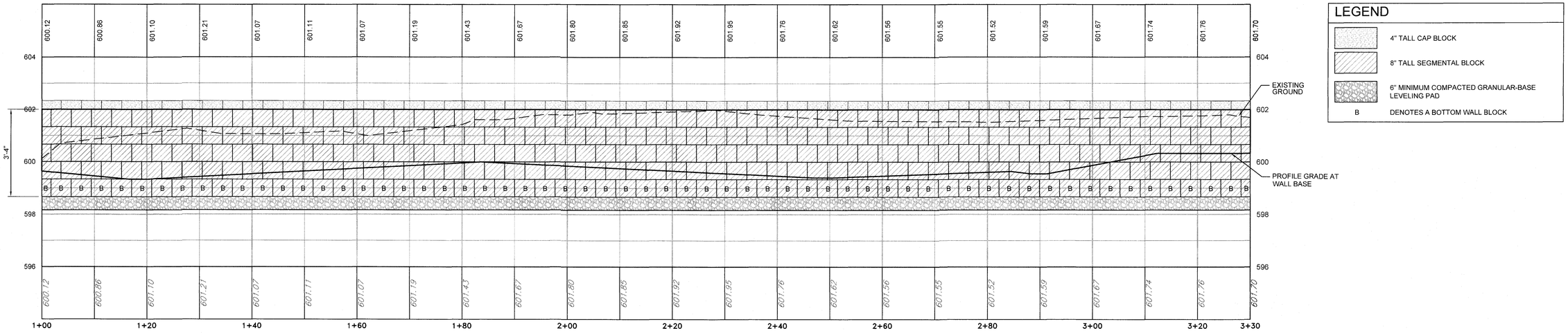
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

STORM AND SANITARY LINE PROFILES

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
9/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
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SHEET NO.	REVISION
C-0-108A	△

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NORTH RETAINING WALL - 1+00 TO 3+30

HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 2'

LEGEND

- 4" TALL CAP BLOCK
- 8" TALL SEGMENTAL BLOCK
- 6" MINIMUM COMPACTED GRANULAR-BASE LEVELING PAD
- B — DENOTES A BOTTOM WALL BLOCK

GENERAL NOTES

1. ENGAGE A QUALIFIED PROFESSIONAL ENGINEER, REGISTERED IN WEST VIRGINIA, TO DESIGN THE RETAINING WALL. SEALED PLANS SHALL BE SUBMITTED AS PART OF SHOP DRAWING SUBMISSIONS AS DEFINED IN THE SPECIFICATIONS.
2. PLACE LEVELING PAD MATERIAL AS SPECIFIED AND COMPACT USING A PLATE COMPACTOR. INSTALL PERFORATED DRAIN PIPE AS SHOWN IN TYPICAL SECTIONS.
3. PLACE ASTM NO. 57 STONE BEHIND THE BLOCKS AND IN THE AREAS BETWEEN THE BLOCKS.
4. DRAINSTONE AND BACKFILL SHALL BE PLACED IN MAXIMUM 6 INCH LIFTS COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR. HAND COMPACTION WITH A VIBRATORY PLATE COMPACTOR SHALL BE USED WITHIN 3 FEET OF THE RETAINING BLOCKS.
5. PLACE SUCCESSIVE UNITS, DRAINSTONE, AND COMPACT BACKFILL TO THE DESIGN GRADE OF THE WALL.
6. CAP PIECES SHALL BE ADHERED WITH A CONCRETE ADHESIVE.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL UNDERGROUND UTILITIES IN THE VICINITY OF THE WALL.
8. THE CONTRACTOR SHALL TAKE CARE NOT TO DISTURB ANY EXISTING STRUCTURES OR UTILITIES ABOVE OR BELOW THE WALL.
9. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF CONDITIONS ARE ENCOUNTERED WHICH DIFFER FROM THOSE ON THE DESIGN DRAWINGS.
10. CONTRACTOR SHALL MAINTAIN POSITIVE GRADES AWAY FROM WALL AT THE END OF EACH DAY TO AVOID DAMAGE WHILE UNDER CONSTRUCTION.

GENERAL SPECIFICATIONS

1.1 SCOPE
WORK INCLUDES FURNISHING AND INSTALLING CONCRETE RETAINING WALL UNITS TO THE LINES AND GRADES DESIGNATED ON THE CONSTRUCTION DRAWINGS AND AS SPECIFIED HEREIN.

1.2 REFERENCE STANDARDS
ASTM C94 READY-MIXED CONCRETE
ASTM C1372 SEGMENTAL RETAINING WALL UNITS

1.3 DELIVERY, STORAGE, AND HANDLING
- A. CONTRACTOR SHALL CHECK THE MATERIALS UPON DELIVERY TO ASSURE PROPER MATERIAL HAS BEEN RECEIVED.
- B. CONTRACTOR SHALL PREVENT EXCESSIVE MUD, WET CEMENT AND LIKE MATERIALS FROM COMING IN CONTACT WITH THE SRW UNITS.
- C. CONTRACTOR SHALL PROTECT THE MATERIALS FROM DAMAGE. DAMAGED MATERIAL SHALL NOT BE INCORPORATED IN THE PROJECT.

MATERIALS

2.1 WALL UNITS
- A. WALL UNITS SHALL BE ANCHOR DIAMOND PRO STRAIGHT FACE SEGMENTAL BLOCK OR APPROVED EQUAL.

2.2 LEVELING PAD AND FREE DRAINING BACKFILL
- A. LEVELING PAD MATERIAL SHALL BE ASTM NO. CRUSHED STONE MATERIAL.
- B. NO. 57 STONE SHALL BE PLACED TO A MINIMUM OF 1 FOOT WIDTH BEHIND THE BACK OF THE WALL AND SHALL EXTEND VERTICALLY FROM THE LEVELING PAD TO AN ELEVATION 4 INCHES BELOW THE TOP OF WALL.
- C. BACKFILL MATERIAL SHALL BE #57 STONE COMPACTED TO 95% STD. PROCTOR AS NOTED HEREIN.
- D. NON-WOVEN GEOTEXTILE CLOTH SHALL BE PLACED BETWEEN THE FREE DRAINING BACKFILL AND RETAINED SOIL.

2.3 DRAINAGE
- A. USE A PERFORATED PIPE AS SHOWN IN THE PLANS PLACED AT THE LOWEST LEVEL OF THE NO. 57 DRAINSTONE. PIPE SHALL EXTEND WITH POSITIVE DRAINAGE AND OUTLET INTO AN EXISTING DRAINAGE STRUCTURE OR FEATURE.

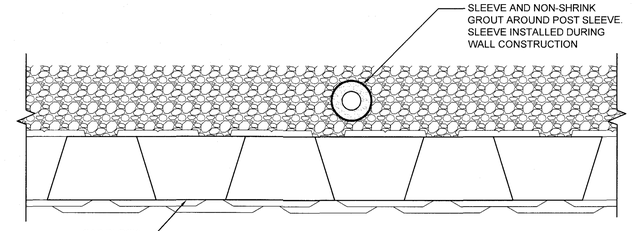
CONSTRUCTION OF WALL SYSTEM

3.1 EXCAVATION
- A. CONTRACTOR SHALL EXCAVATE TO THE LINES AND GRADES SHOWN ON THE CONSTRUCTION DRAWINGS AS NECESSARY IN ORDER TO ACHIEVE UNIFORM BEARING CAPACITY FOR THE ENTIRE LENGTH OF THE WALL.
- B. CONTRACTOR SHALL ENGAGE GEOTECHNICAL ENGINEER TO VERIFY ADEQUATE BEARING MATERIALS ARE PRESENT PRIOR TO THE PLACEMENT OF LEVELING PAD, AND FOR COMPACTION TESTING OF LEVELING PAD AND UTILITY TRENCH BACKFILL PLACEMENT.

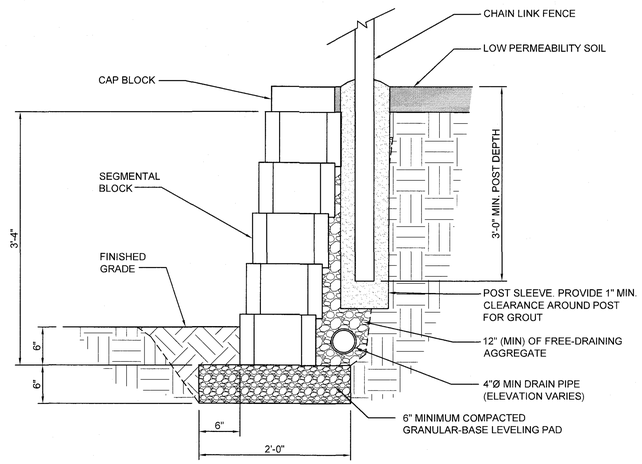
3.2 FOUNDATION SOIL PREPARATION
- A. NATIVE FOUNDATION SOIL SHALL BE COMPACTED TO 95% OF STANDARD PROCTOR PRIOR TO PLACEMENT OF THE LEVELING PAD MATERIAL.
- B. IN-SITU FOUNDATION SOIL SHALL BE EXAMINED BY A GEOTECHNICAL ENGINEER TO ENSURE THAT THE ACTUAL FOUNDATION SOIL STRENGTH MEETS OR EXCEEDS PROVIDED DESIGN STRENGTH. SOIL NOT MEETING THE REQUIRED STRENGTH SHALL BE REMOVED AND REPLACED WITH ACCEPTABLE, COMPACTED MATERIAL.

3.3 LEVELING PAD PLACEMENT
- A. LEVELING PAD SHALL BE PLACED AS SHOWN ON THE CONSTRUCTION DRAWINGS.
- B. LEVELING PAD SHALL BE COMPACTED TO 95% OF STANDARD PROCTOR TO ENSURE A LEVEL, HARD SURFACE ON WHICH TO PLACE THE FIRST COURSE OF BLOCKS. PAD SHALL BE CONSTRUCTED TO THE PROPER ELEVATION TO ENSURE THE FINAL ELEVATION SHOWN ON THE PLANS.
- C. LEVELING PAD SHALL HAVE A 6 INCH MINIMUM DEPTH. PAD DIMENSIONS SHALL EXTEND BEYOND THE BLOCKS IN ALL DIRECTIONS AS DESIGNED.

3.4 UNIT INSTALLATION
- A. THE FIRST COURSE OF WALL UNITS SHALL BE PLACED ON THE PREPARED LEVELING PAD WITH THE AESTHETIC SURFACE FACING OUT AND THE FRONT EDGES TIGHT TOGETHER. ALL UNITS SHALL BE CHECKED FOR LEVEL AND ALIGNMENT AS THEY ARE PLACED.
- B. ENSURE THAT UNITS ARE IN FULL CONTACT WITH LEVELING PAD. PROPER CARE SHALL BE TAKEN TO DEVELOP STRAIGHT LINES AND SMOOTH CURVES ON THE BASE COURSE AS PER WALL LAYOUT.
- C. THE BACKFILL IN FRONT AND BACK OF THE ENTIRE BASE ROW SHALL BE PLACED AND COMPACTED TO FIRMLY LOCK THEM IN PLACE. CHECK ALL UNITS AGAIN FOR LEVEL AND ALIGNMENT. ALL EXCESS MATERIAL SHALL BE SWEPT FROM TOP OF UNITS.
- D. INSTALL NEXT COURSE OF WALL UNITS ON TOP OF BASE ROW. POSITION BLOCKS TO BE OFFSET FROM SEAMS OF BLOCKS BELOW. BLOCKS SHALL BE PLACED FULLY FORWARD SO UNITS ARE ENGAGED. CHECK EACH BLOCK FOR PROPER ALIGNMENT AND LEVEL. BACKFILL TO EXCAVATED WIDTH BEHIND BLOCK WITH FREE DRAINING BACKFILL. SPREAD BACKFILL IN UNIFORM LIFTS NOT TO EXCEED 6 INCHES. EMPLOY METHODS USING LIGHT-WEIGHT COMPACTION EQUIPMENT THAT WILL NOT DISRUPT THE STABILITY OR BATTER OF THE WALL. HAND-OPERATED PLATE COMPACTION EQUIPMENT SHALL BE USED AROUND THE BLOCK AND WITHIN 3 FEET OF THE WALL TO ACHIEVE CONSOLIDATION. COMPACT BACKFILL TO 95% OF STANDARD PROCTOR (ASTM D 698, AASHTO T-99) DENSITY WITHIN 2% OF ITS OPTIMUM MOISTURE CONTENT.
- E. INSTALL EACH SUBSEQUENT COURSE IN LIKE MANNER. REPEAT PROCEDURE TO THE EXTENT OF WALL HEIGHT.



PLAN



SEGMENTAL RETAINING WALL TYPICAL SECTION

SCALE: 1" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

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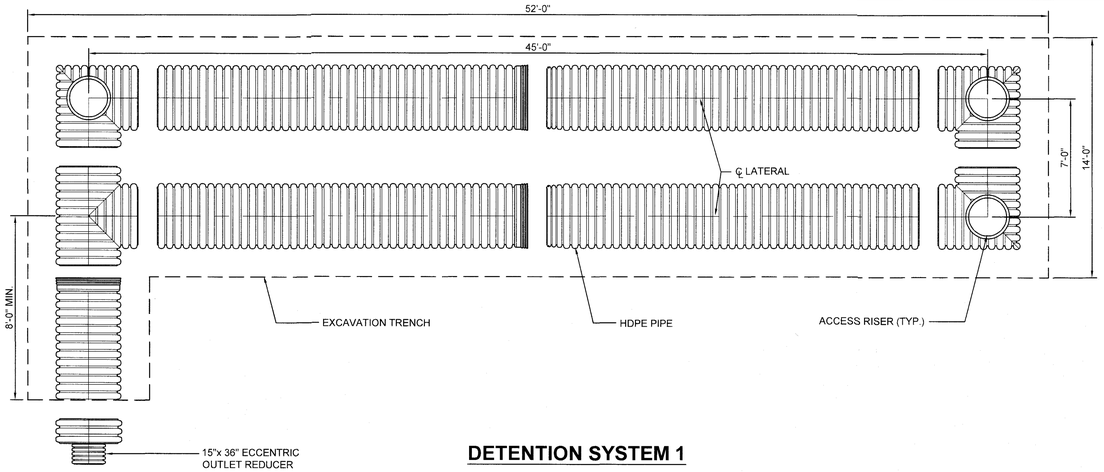
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

NORTH RETAINING WALL
PROFILE AND DETAILS

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
9/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	FLB/KJW
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-109	

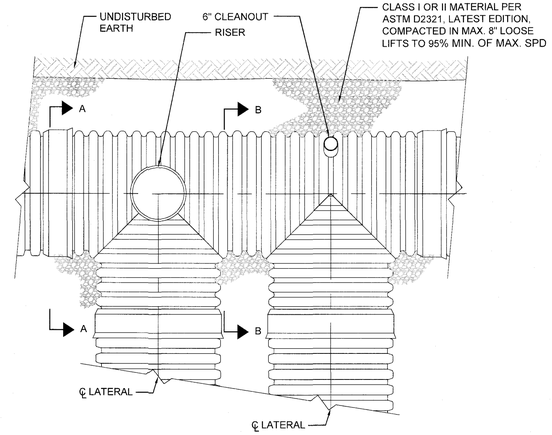
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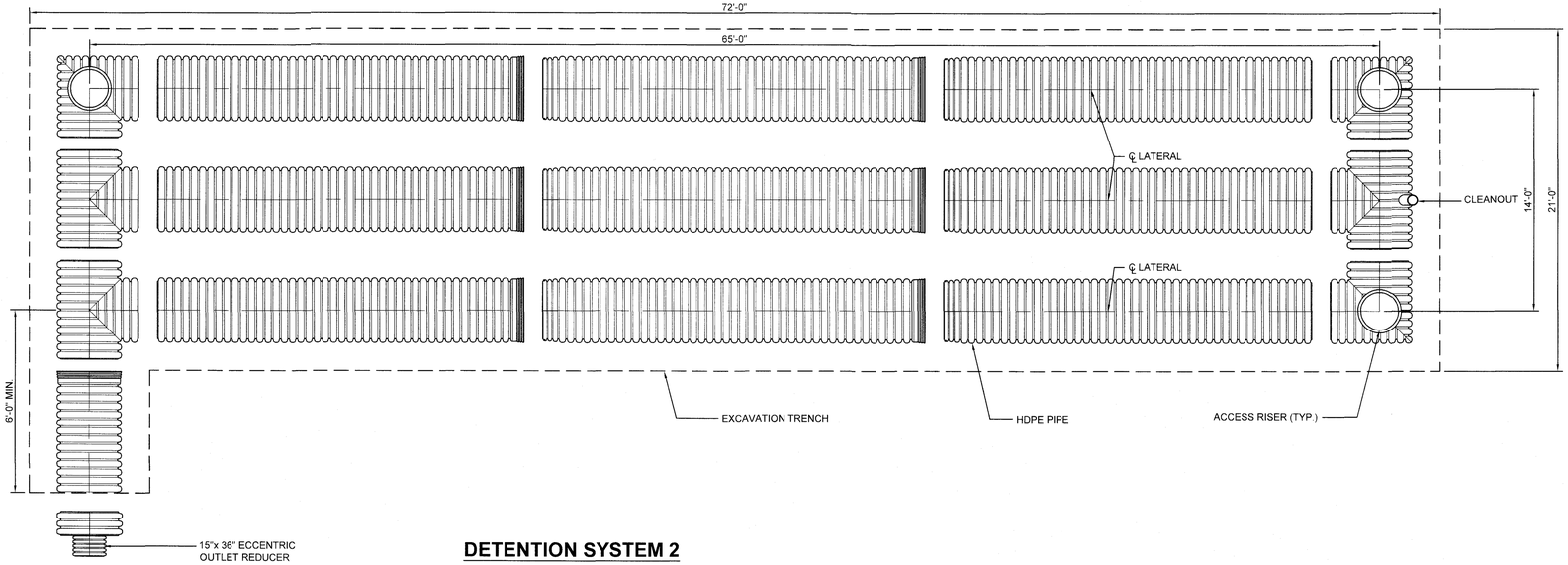
DETENTION SYSTEM 1

NOTES:

1. ALL REFERENCES TO CLASS I OR II MATERIAL ARE PER ASTM D2321 "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST EDITION.
2. ALL RETENTION AND DETENTION SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, LATEST EDITION AND THE MANUFACTURER'S PUBLISHED INSTALLATION GUIDELINES.
3. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I OR II IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
4. MINIMUM COVER: FOR TRAFFIC APPLICATIONS, MINIMUM COVER IS 12" UP TO 36" DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

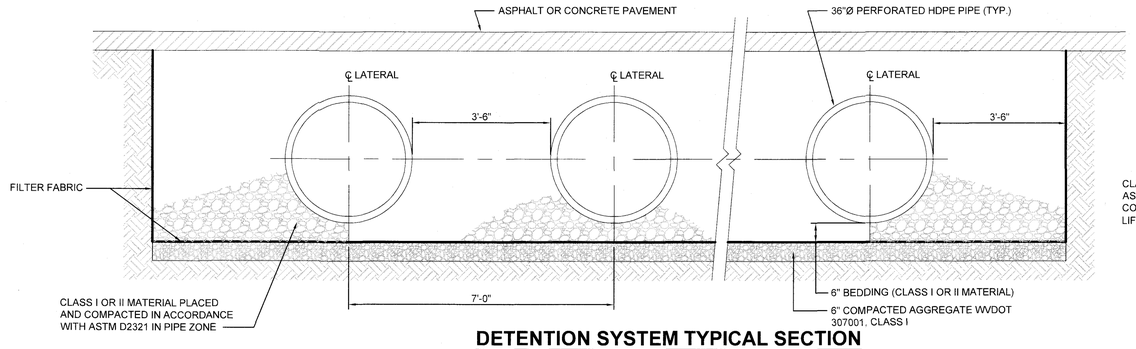


RETENTION-DETENTION SYSTEM (RISER AND CLEANOUT) DETAIL

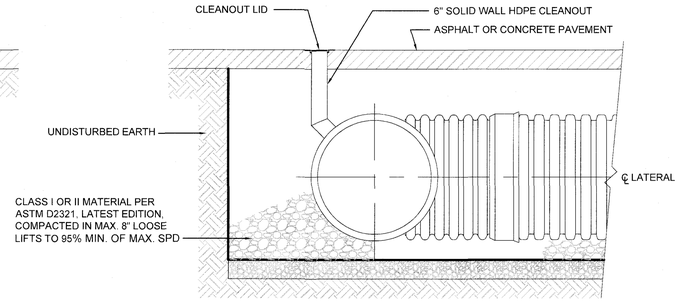


DETENTION SYSTEM 2

SECTION A-A



DETENTION SYSTEM TYPICAL SECTION



SECTION B-B

REVISION NUMBER	REVISIONS	DATE	BY

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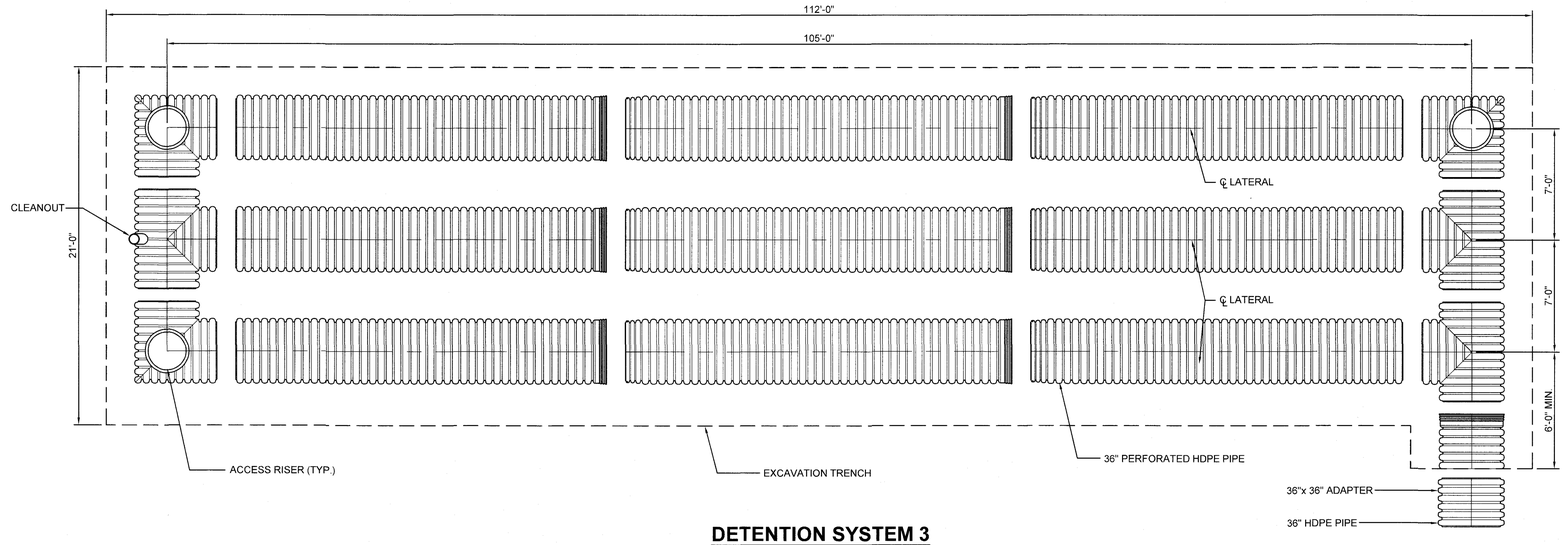
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

STORMWATER DETENTION SYSTEM DETAILS

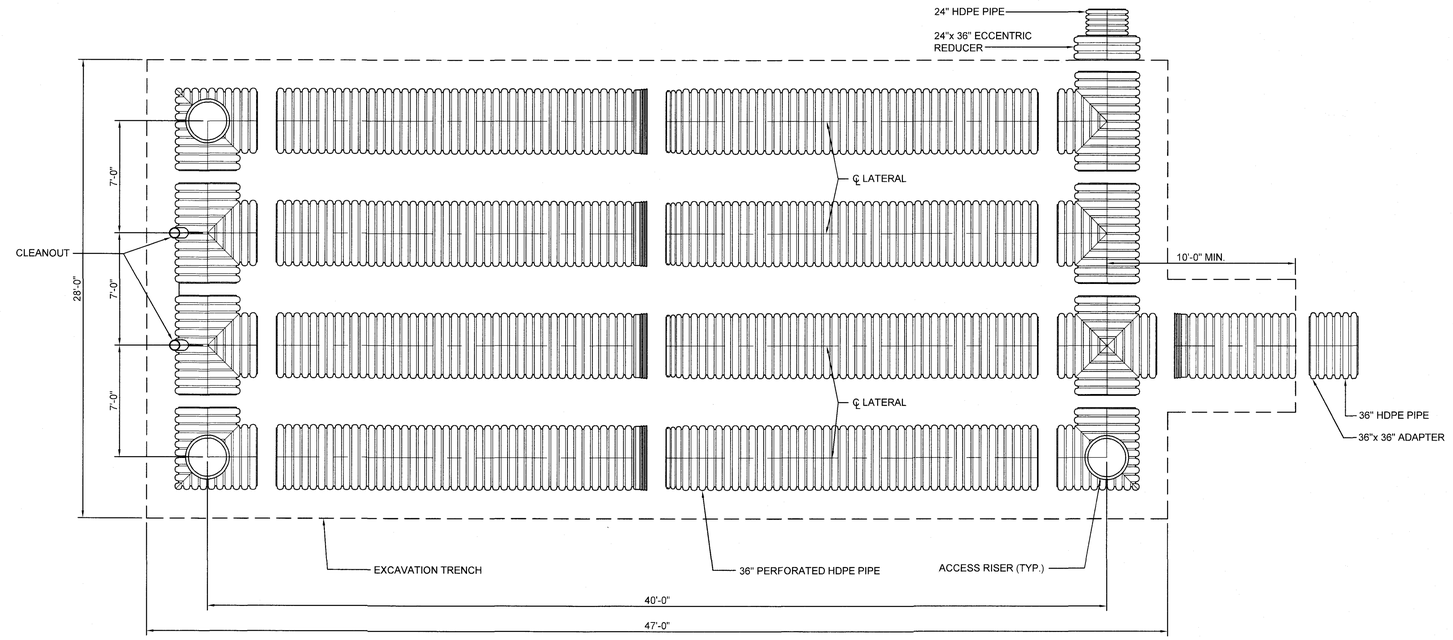
SEAL
ROBERT C. DENUDE
REGISTERED
23341
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

JOB NUMBER:	19027
SCALE:	NONE
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-110	△

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DETENTION SYSTEM 3



DETENTION SYSTEM 4

NOTE:
SEE SHEET C-0-110 FOR DETENTION SYSTEM TYPICAL SECTION AND DETAILS

REVISION NUMBER	REVISIONS	DATE	BY

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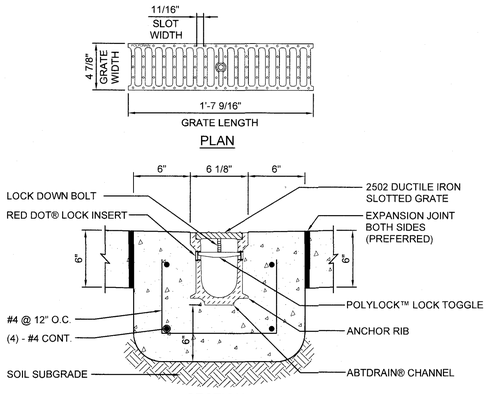
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

STORMWATER DETENTION SYSTEM DETAILS

SEAL
ROBERT C. DENZIL
REGISTERED
23341
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER

JOB NUMBER:	19027
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DATE:	AUGUST 6, 2021
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SHEET NO.	REVISION
C-0-110A	△

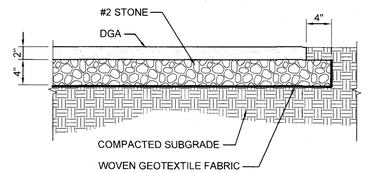
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TRENCH DRAIN DETAIL

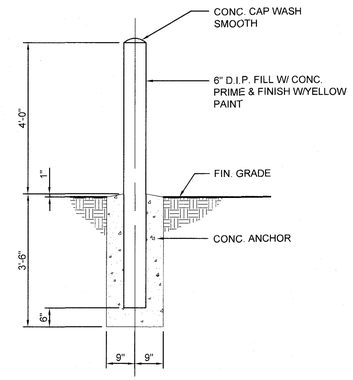
SCALE: 1 1/2" = 1'-0"

NOTE: TRENCH DRAIN SHALL BE POLYDRAIN PRECAST POLYMER CONCRETE OR APPROVED EQUAL.



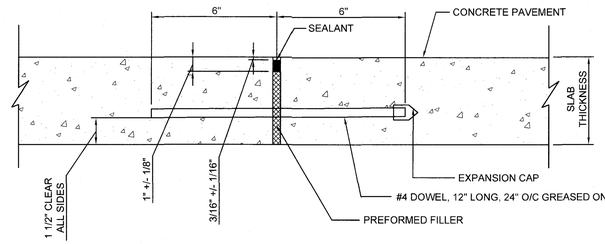
GRAVEL PAVEMENT DETAIL

SCALE: 1" = 1'-0"



BOLLARD DETAIL

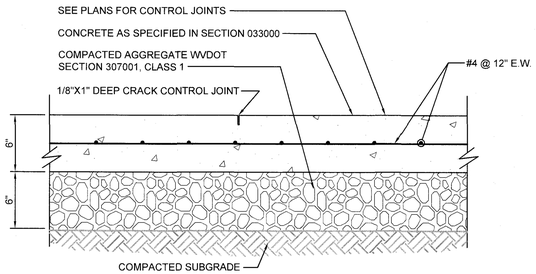
SCALE: 1/2" = 1'-0"



DOWELED EXPANSION JOINT DETAIL

NOT TO SCALE

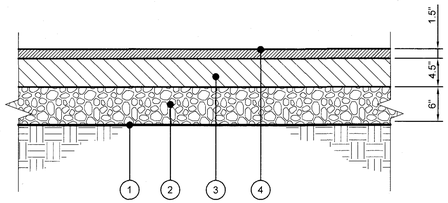
NOTES:
1. PREFORMED FILLER MAY BE FIBERBOARD OR OTHER APPROVED MATERIAL WHICH CAN BE SAWED OR SECTION REMOVED TO FORM SEALANT KERF.
2. USE THIS METHOD WHEN TYING INTO EXISTING CONCRETE



NOTE: ANY CONCRETE STRUCTURE ABUTTING CONCRETE PAVEMENT REQUIRES AN EXPANSION JOINT. JOINT SEALANT CONFORMING TO SECTION 708.4 OF WVDOT STANDARD SPECIFICATIONS.

TYPE 1 CONCRETE PAVEMENT

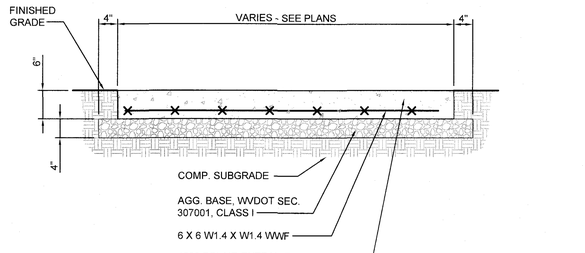
SCALE: 1 1/2" = 1'-0"



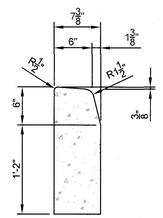
1	207034-000	FABRIC FOR SEPARATION
2	307001-000	AGGREGATE BASE COURSE, CLASS 1
3	401001-001	MARSHALL HOT-MIX ASPHALT BASE COURSE, STONE OR GRAVEL TYPE 1
4	401002-001	MARSHALL HOT-MIX ASPHALT WEARING COURSE, STONE OR GRAVEL TYPE I

ASPHALT PAVING DETAIL

SCALE: NONE

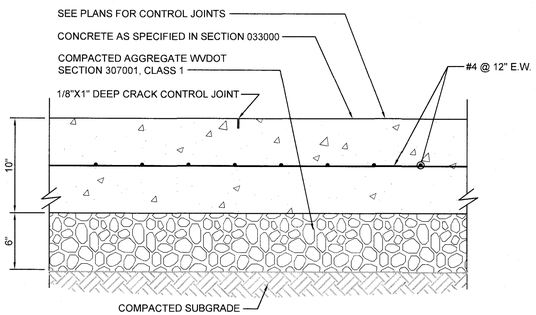


CONCRETE SIDEWALK



PLAIN CONCRETE CURB TYPE I

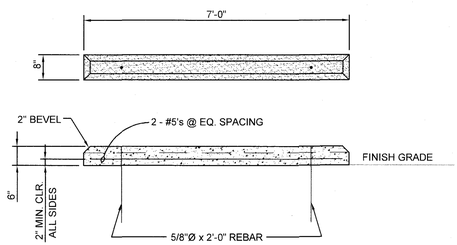
SCALE: 1" = 1'-0"



NOTE: ANY CONCRETE STRUCTURE ABUTTING CONCRETE PAVEMENT REQUIRES AN EXPANSION JOINT. JOINT SEALANT CONFORMING TO SECTION 708.4 OF WVDOT STANDARD SPECIFICATIONS.

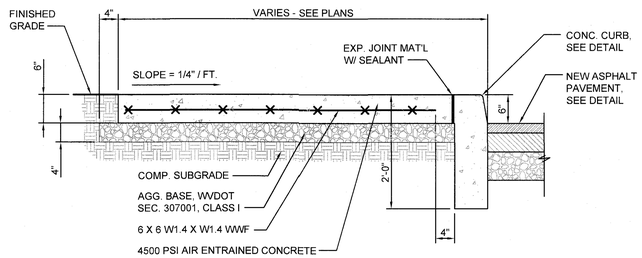
TYPE 2 CONCRETE PAVEMENT

SCALE: 1 1/2" = 1'-0"

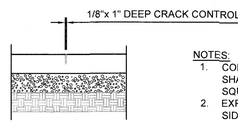


CONCRETE PARKING CURB

SCALE: 1/2" = 1'-0"



CONCRETE SIDEWALK WITH CURB



NOTES:
1. CONTROL JOINTS, SPACED AT 5'-0" TO 6'-0" INTERVALS, SHALL BE INSTALLED IN THE SIDEWALK TO FORM SQUARE PANELS.
2. EXPANSION JOINTS SHALL ALSO BE PLACED WHERE SIDEWALKS ABUT OTHER STRUCTURES.

CRACK CONTROL JOINT

CONCRETE WALK DETAILS

SCALE: 3/4"=1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

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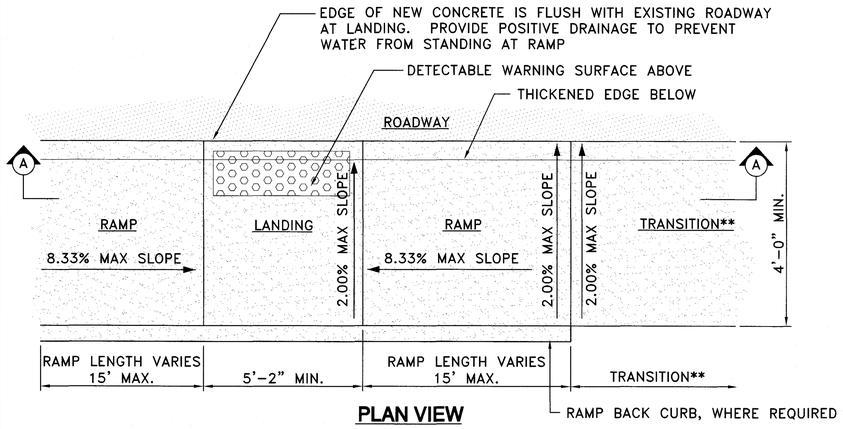
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE DETAILS

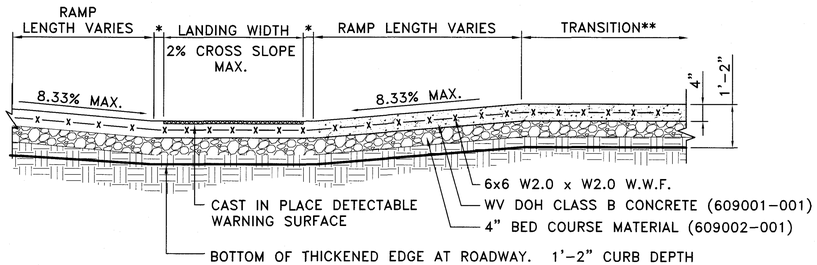
SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
5/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KJW
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-500	

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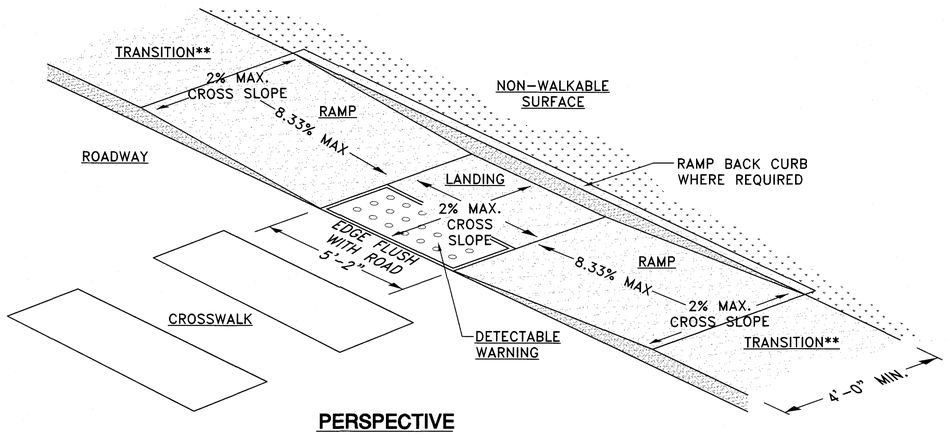


PLAN VIEW



* SEE DETECTABLE WARNING SURFACE DETAIL
** SEE TRANSITION TO EXISTING NON-COMPLIANT SIDEWALK DETAIL

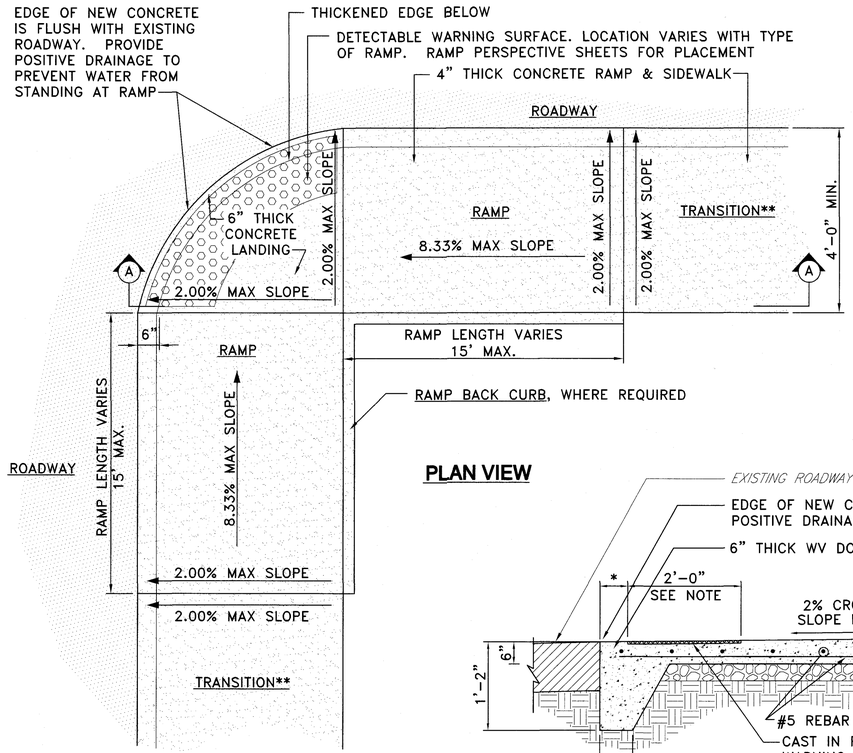
SECTION A-A



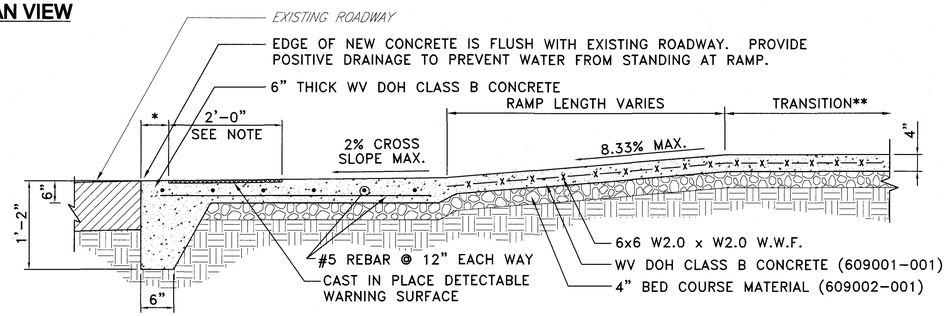
PERSPECTIVE

TYPE 3 RAMP

NOT TO SCALE



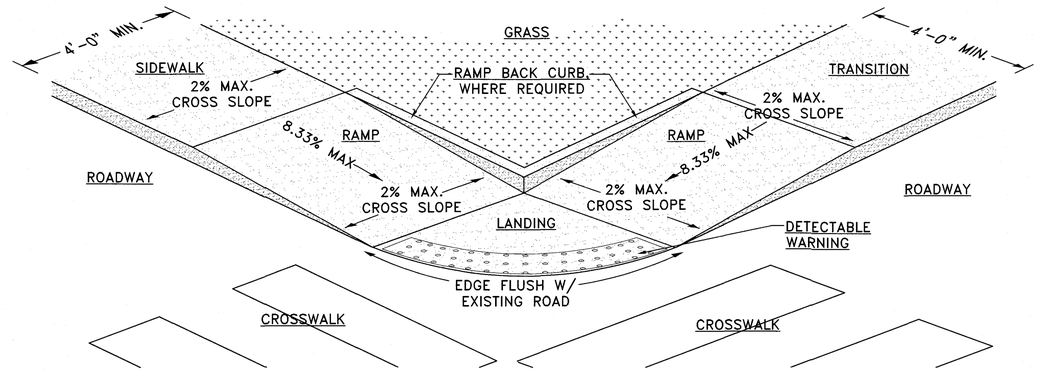
PLAN VIEW



NOTE: SEE RAMP PERSPECTIVE SHEETS FOR PLACEMENT OF DETECTABLE WARNING SURFACE.

* SEE DETECTABLE WARNING SURFACE DETAIL
** SEE TRANSITION TO NON-COMPLIANT SIDEWALK DETAIL

SECTION A-A



PERSPECTIVE

TYPE 3 "DEPRESSED CORNER"

NOT TO SCALE

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

AIRPORT PLANNING / DEVELOPMENT
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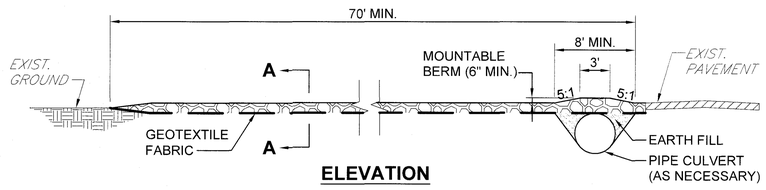
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE DETAILS

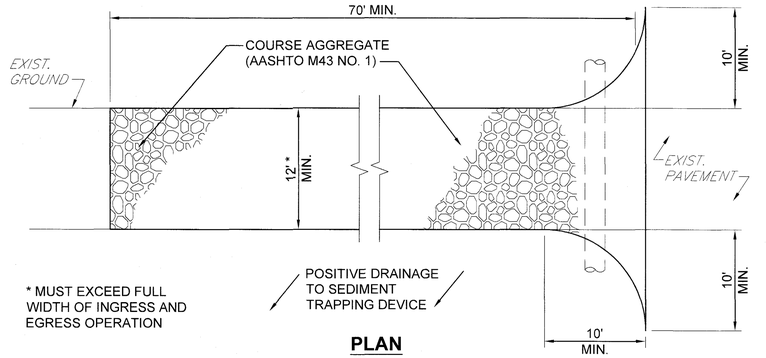
SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 287
STATE OF WEST VIRGINIA
4/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-501	△

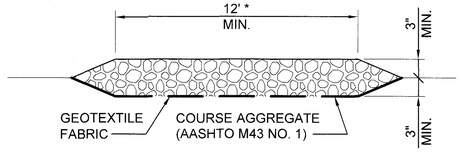
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ELEVATION



PLAN



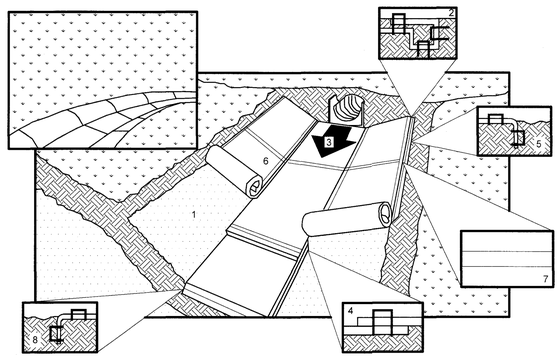
SECTION A-A

NOTES:

1. PLACE STABILIZED CONSTRUCTION ENTRANCE (SCE) IN ACCORDANCE WITH THE APPROVED PLAN. VEHICLES MUST TRAVEL OVER THE ENTIRE LENGTH OF THE SCE. USE MINIMUM LENGTH OF 70 FEET AND A MINIMUM WIDTH OF 12 FEET. FLARE SCE 10 FEET MINIMUM AT THE EXISTING ROAD TO PROVIDE A TURNING RADIUS.
2. PIPE ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD THE SCE UNDER THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE. PROTECT PIPE INSTALLED THROUGH THE SCE WITH A MOUNTABLE BERM WITH 5:1 SLOPES AND A MINIMUM OF 12 INCHES OF STONE OVER THE PIPE. PREPARE SUBGRADE AND PLACE GEOTEXTILE FABRIC, AS SPECIFIED.
3. PLACE CRUSHED AGGREGATE (AASHTO M43 NO. 1) AT LEAST 6 INCHES DEEP OVER THE LENGTH AND WIDTH OF THE SCE.
4. MAINTAIN ENTRANCE IN A CONDITION THAT MINIMIZES TRACKING OF SEDIMENT. ADD STONE OR MAKE OTHER REPAIRS AS CONDITIONS DEMAND TO MAINTAIN CLEAN SURFACE, MOUNTABLE BERM, AND SPECIFIED DIMENSIONS. IMMEDIATELY REMOVE STONE AND/OR SEDIMENT SPILLED, DROPPED, OR TRACKED ONTO ADJACENT ROADWAY BY VACUUMING, SCRAPING, AND/OR SWEEPING. WASHING ROADWAY TO REMOVE MUD TRACKED ONTO PAVEMENT IS NOT ACCEPTABLE UNLESS WASH WATER IS DIRECTED TO AN APPROVED SEDIMENT CONTROL DEVICE.

STABILIZED CONSTRUCTION ENTRANCE

SCALE: NONE (0227202)

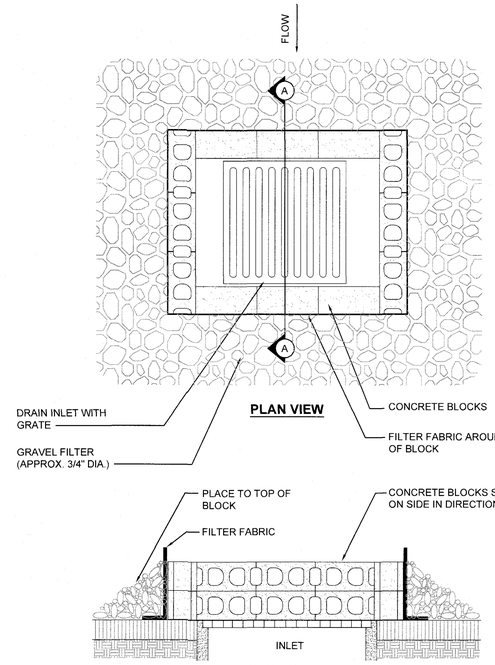


TYPICAL EROSION MATTING INSTALLATION IN SWALE

SCALE: NTS (0227014)

NOTES:

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN 6" (15 cm) DEEP x 6" (15 cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
3. ROLL THE BLANKET IN DIRECTION OF WATER FLOW ON BOTTOM OF CHANNEL.
4. PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH A 6" (15 cm) OVERLAP. USE A DOUBLE ROW OF STAGGERED STAPLES 4"(10 cm) APART TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED IN 6" (15 cm) DEEP x 6" (15 cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. BLANKETS ON SIDE SLOPES MUST BE OVERLAPPED 4" (10 cm) OVER THE CENTER BLANKET AND STAPLED [2" (5 cm) FOR C350 MATTING].
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT INTERVALS. USE A ROW OF STAPLES 4" APART OVER ENTIRE WIDTH OF THE CHANNEL. PLACE A SECOND ROW 4" BELOW THE FIRST ROW IN A STAGGERED PATTERN.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED IN A 6" DEEP x 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

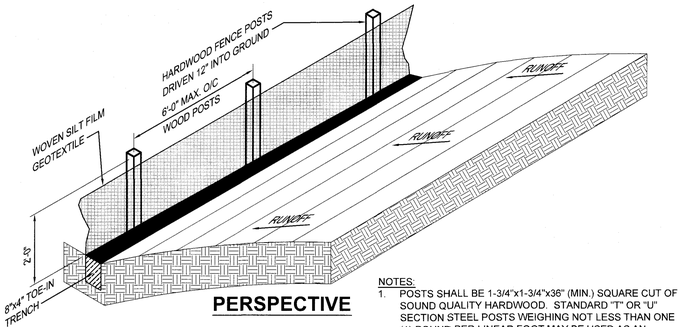


PLAN VIEW

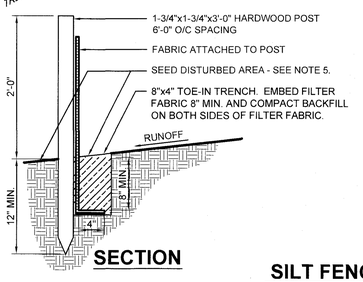
SECTION A-A

INLET INFILTRATION PROTECTION

SCALE: NONE (0227012)



PERSPECTIVE



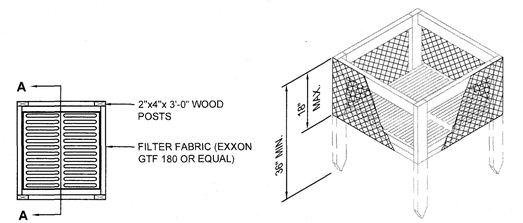
SECTION

NOTES:

1. POSTS SHALL BE 1-3/4"x1-3/4"x36" (MIN.) SQUARE CUT OF SOUND QUALITY HARDWOOD. STANDARD "T" OR "U" SECTION STEEL POSTS WEIGHING NOT LESS THAN ONE (1) POUND PER LINEAR FOOT MAY BE USED AS AN ALTERNATE.
2. WOVEN SILT FILM GEOTEXTILE FABRIC TO BE FASTENED SECURELY TO POSTS WITH WIRE TIES OR STAPLES.
3. WHEN TWO SECTIONS OF SILT FENCE ADJOIN EACH OTHER, OVERLAP THE LAST POST OF THE FIRST ROLL WITH THE FIRST POST OF THE OTHER, THEN FOLD FABRIC AT LEAST ONE (1) FULL TURN AROUND EACH POST.
4. EXTEND ENDS OF SILT FENCE A MINIMUM OF FIVE (5) FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT TO PREVENT RUNOFF FROM BYPASSING.
5. FILTER FABRIC SHALL BE NON-WOVEN "ADS GEOSYNTHETICS 3302W", "THRACE-LINQ GTF 200", OR EQUAL.
6. SEED A 6'-0" STRIP ON EACH SIDE OF SILT FENCE WITH TEMPORARY SEED MIX AS PER SPECIFICATIONS.
7. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND INSPECTED FOR DAMAGE AFTER EACH RAIN EVENT. REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT.

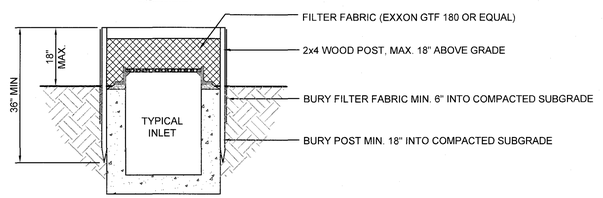
SILT FENCE DETAIL

SCALE: NONE (0227003)



PLAN

ISOMETRIC VIEW



SECTION A-A

INLET INFILTRATION PROTECTION

SCALE: NONE (0227002-b)

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
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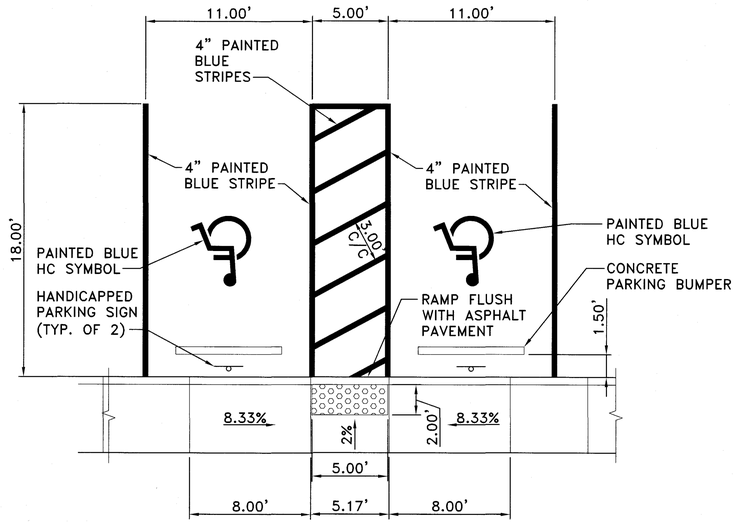
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE DETAILS

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
7/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-502	

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HANDICAPPED PARKING DETAIL

SCALE: 1'=5'

For Info on NPDES Storm Water Permit

To comment on Sediment Control Plan:

Call: 800-654-5227

or

plan@wvdep.org

DEP 601 57th Street, SE, Charleston, WV 25304

Application date: _____

WV Department of Administration

East Campus Project

NOTE: THE SIGN WILL BE AT LEAST 24"x24" WITH 1.6" AND .8" LETTERS.

NPDES PUBLIC NOTICE SIGN

SCALE: NONE

SEDIMENT AND EROSION CONTROL NOTES

1. ALL SEDIMENT AND EROSION CONTROL MEASURES ARE SUBJECT TO INSPECTION AND CHANGES BY THE WVDEP OR ENGINEER.
2. LIMIT THE AMOUNT OF TOTAL DISTURBANCE ON SITE TO A MINIMUM. FINAL CONDITIONS ON SITE SHALL BE PREPARED AS A VEGETATED LAWN GRASS COVER MAINTAINED IN GOOD CONDITION UNTIL COMPLETION OF WORK.
3. ALL PAVED SURFACES (CONCRETE, ASPHALT, RIP-RAP, ETC.) SHALL BE INSTALLED AS SOON AS POSSIBLE UPON COMPLETION OF THE FINAL GRADING.
4. IN ORDER TO PREVENT AND TO PROVIDE FOR ABATEMENT AND CONTROL OF ANY ENVIRONMENTAL POLLUTION ARISING FROM THEIR CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS CONCERNING ENVIRONMENTAL POLLUTION CONTROL AND ABATEMENT, AS WELL AS SPECIFIC REQUIREMENTS AND CONDITIONS OF ANY NECESSARY PERMITS FOR CONSTRUCTION OBTAINED BY THE OWNER.
5. THE CONTRACTOR IS RESPONSIBLE TO KEEP A RECORD OF WHEN CONSTRUCTION ACTIVITIES HAVE BEGUN AND HAVE EITHER TEMPORARILY OR PERMANENTLY CEASED AND WHEN SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INITIATED, INSPECTED, MAINTAINED, AND REMOVED.
6. WASTE AREAS - THROUGH OBTAINING A NPDES STORMWATER SITE REGISTRATION PERMIT FROM WVDEP, THE ENGINEER HAS INCLUDED APPROXIMATELY 0.5 ACRE TO BE USED BY THE CONTRACTORS FOR WASTE SITES. THE CONTRACTORS WILL DETERMINE THE EXACT LOCATIONS OF EACH SITE WHICH WILL THEN BE ADDED TO THE PERMIT. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE EROSION AND SEDIMENT CONTROLS AT EACH SITE INCLUDING, BUT NOT LIMITED TO, SILT FENCE, DIVERSION DITCHES, ROCK CHECK STRUCTURES, ETC. AS APPROPRIATE, AND THE RECLAMATION THEREOF ONCE CONSTRUCTION IS COMPLETE.
7. OTHER CONSTRUCTION PRACTICES - ANY WATER PUMPED FROM EXCAVATED AREAS SHALL NOT BE DISCHARGED DIRECTLY INTO ANY WATERCOURSE. ADEQUATE PROVISIONS MUST BE TAKEN TO PREVENT SEDIMENT AND EROSION FROM ENTERING THE WATERCOURSE.
8. NO MORE THAN 500 LF OF TRENCH MAY BE OPEN AT ANY GIVEN TIME.
9. OTHER CONSTRUCTION PRACTICES - ANY WATER PUMPED FROM EXCAVATED AREAS SHALL NOT BE DISCHARGED DIRECTLY INTO ANY WATERCOURSE. ADEQUATE PROVISIONS MUST BE TAKEN TO PREVENT SEDIMENT AND EROSION FROM ENTERING THE WATERCOURSE.
10. AREAS WHERE THE SEED HAS FAILED TO GERMINATE ADEQUATELY (UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70%) WITHIN 30 DAYS AFTER SEEDING AND MULCHING MUST BE RESEEDED IMMEDIATELY, OR AS SOON AS WEATHER CONDITIONS ALLOW.

GENERAL ENVIRONMENTAL NOTES

1. THE CONTRACTOR SHALL PROVIDE MEANS TO HANDLE SPILLS AND WASTE MATERIAL DISPOSAL. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

   a. A CONTAINMENT DIKE SHALL BE PROVIDED AROUND ANY ON-SITE FUEL STORAGE TANKS. IT SHALL HAVE A CAPACITY OF 110% OF THE SIZE OF THE STORAGE TANK.

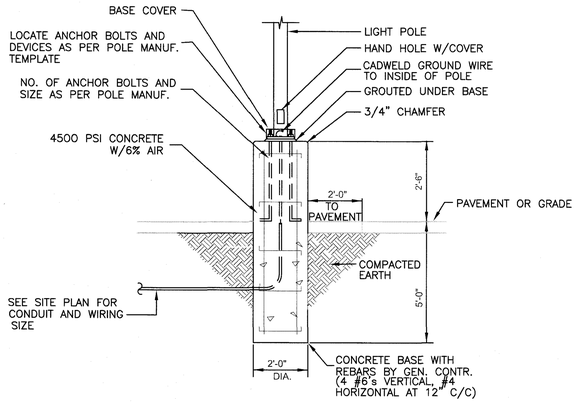
   b. ABSORBENT PADS SHALL BE AVAILABLE ON SITE FOR PETROLEUM SPILLS OR LEAKS ON GROUND. ABSORBENT BOOMS SHALL BE PROVIDED FOR SPILLS IN STREAMS.

   c. EXCESS CONCRETE SHALL NOT BE DISPOSED OF NEAR STREAMS.

2. THE CONTRACTOR SHALL REPORT ANY NONCOMPLIANCE WHICH MAY ENDANGER HEALTH OR THE ENVIRONMENT IMMEDIATELY AFTER BECOMING AWARE OF THE CIRCUMSTANCES BY CALLING THE DEPARTMENT OF ENVIRONMENTAL PROTECTION SPILL ALERT TELEPHONE NUMBER, 1-800-642-3074, AND ADVISING THE ENGINEER OF SUCH OCCURRENCE. CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A RECORD OF SUCH CALLS.

SEQUENCE OF EVENTS

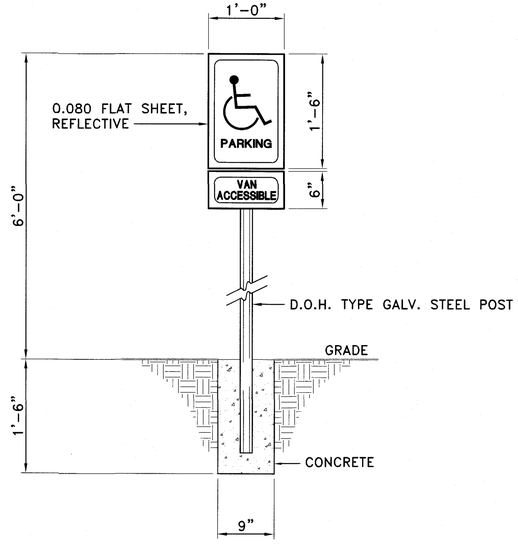
1. CONTRACTOR IS RESPONSIBLE TO ESTABLISH A TIME SCHEDULE FOR EVENTS LISTED HERE FORWARD FOR CONTRACT START DATE.
2. INSTALL TEMPORARY SEDIMENT CONTROL STRUCTURES AS SHOWN ON PLAN BEFORE COMPLETION OF FIRST DAY.
3. BEGIN CLEARING AND GRUBBING.
4. ALL TEMPORARY EARTHWORK STOCKPILES EXPECTED TO BE LEFT OPEN FOR MORE THAN (7) DAYS SHALL BE TRACKED-IN AND TEMPORARILY SEEDED.
5. INSTALL PERMANENT STORM WATER CONTROL MEASURES.
6. INSPECT ALL SEDIMENT AND EROSION CONTROL DEVICES ON A REGULAR BASIS AND IMMEDIATELY FOLLOWING ANY RAINFALL.
7. PERFORM ALL NECESSARY MAINTENANCE SEDIMENT AND EROSION CONTROL DEVICES. REPAIR OR REPLACE ALL MATERIALS WHEN NECESSARY OR AS DIRECTED BY THE ENGINEER.
8. REFER TO PLANS FOR ANY PERMANENT SEEDING AND THE SPECIFICATIONS FOR SEEDING AND MULCHING SCHEDULES. ALL DISTURBED AREAS SHALL BE PERMANENTLY SEEDED WITHIN (7) DAYS OF COMPLETION OF FINAL GRADING.
9. REMOVE ALL TEMPORARY SEDIMENT AND EROSION CONTROL DEVICES UPON THE COMPLETION OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR WVDEP.



POLE BASE DETAIL

NO SCALE

NOTE:
ANCHOR BOLTS SHALL BE ENCLOSED BY LATERAL REINFORCEMENT (TIES) THAT ALSO SURROUNDS AT LEAST (4) VERT. BARS IN THE PIER. THIS REINFORCEMENT SHALL BE LOCATED IN THE TOP 6" OF THE PIER AND SHALL CONSIST OF (2)-#3 BARS.



HANDICAPPED PARKING SIGN

SCALE: NONE (1043002)

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group, a division of GRW

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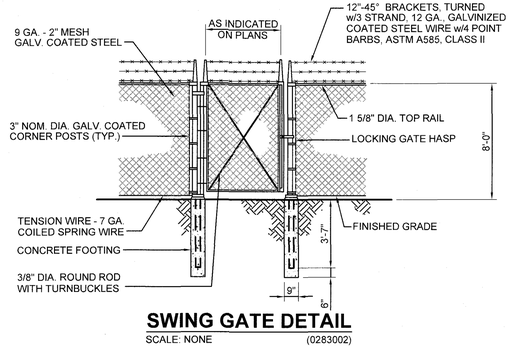
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE DETAILS

SEAL: PROFESSIONAL LANDSCAPE ARCHITECT, ROGER J. KENNEDY, No. 1007, STATE OF WEST VIRGINIA, 10/21

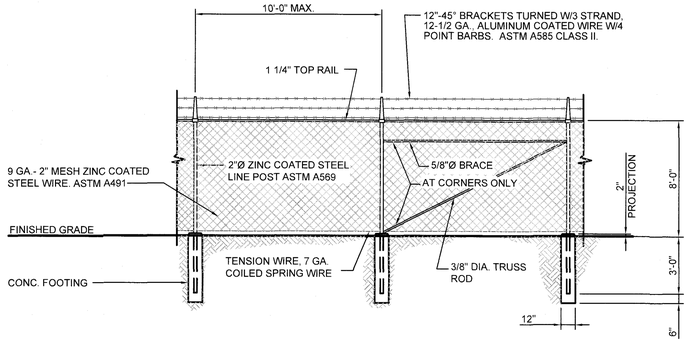
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	C-0-503
REVISION	△

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SWING GATE DETAIL

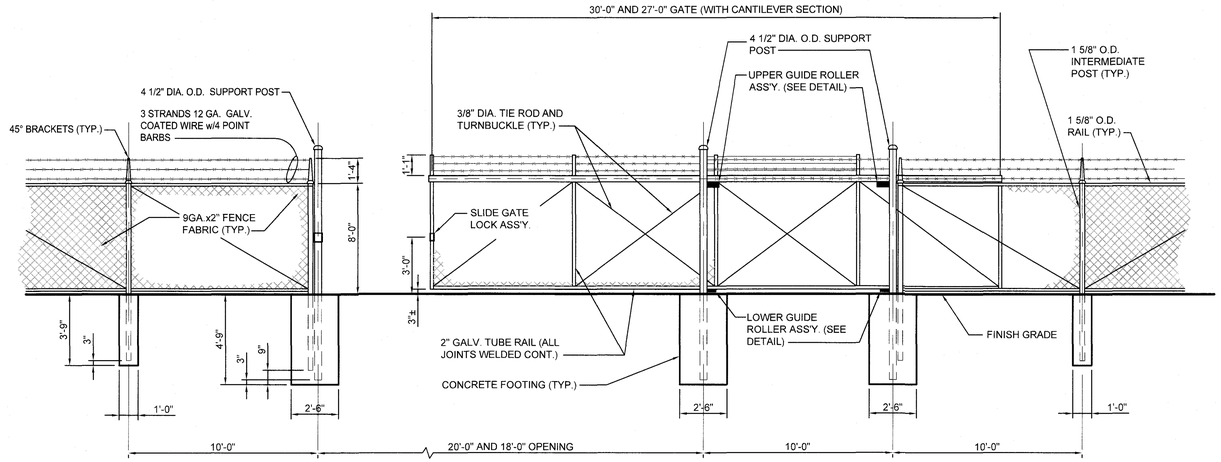
SCALE: NONE (0283002)



FENCE DETAIL

NO SCALE (0283008)

NOTE: INSTALL PRIVACY SLATS WHERE INDICATED. SLATS MANUFACTURED BY SOLITUBE, COLOR BEIGE OR APPROVED EQUAL.



CANTILEVER SLIDE GATE ELEVATION

SCALE: 1/4" = 1'-0" (0283004)

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

AIRPORT PLANNING / DEVELOPMENT
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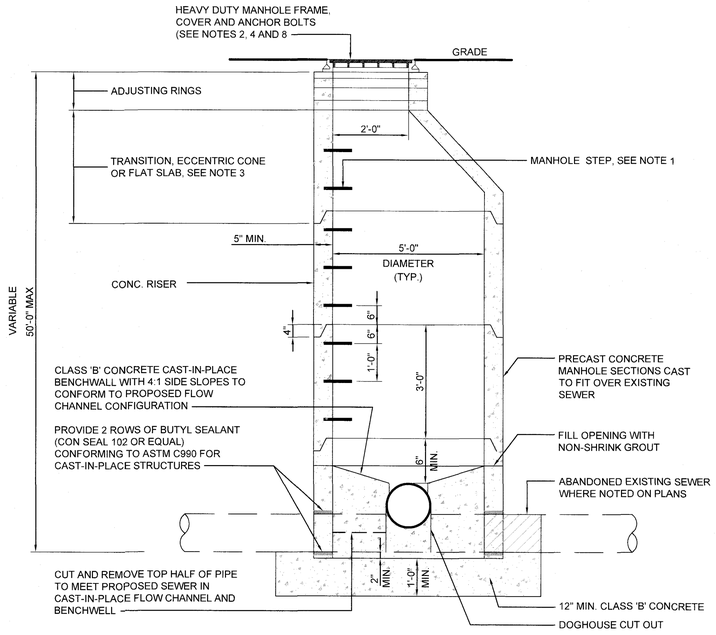
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

SITE DETAILS

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 287
STATE OF WEST VIRGINIA
9/6/21

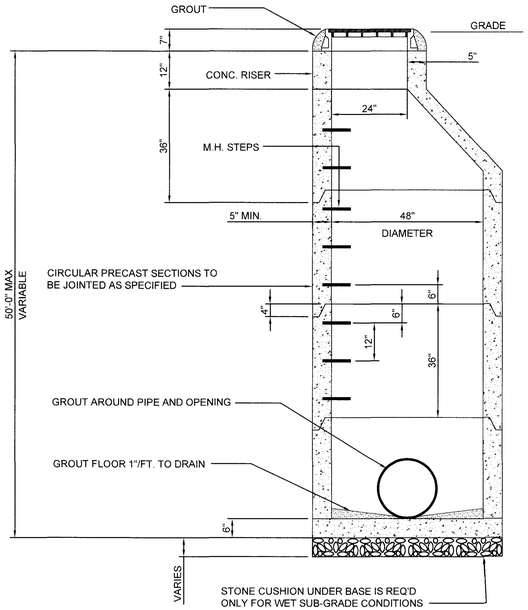
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-504	

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STANDARD "DOGHOUSE" MANHOLE

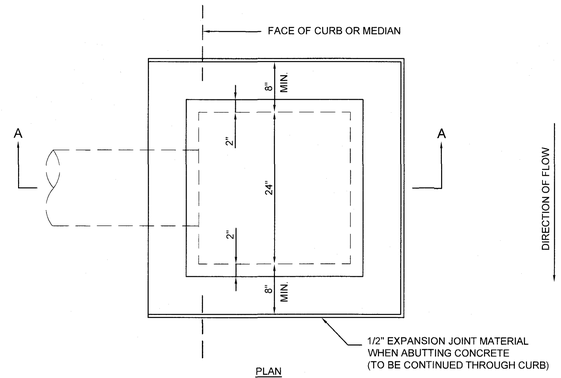
SCALE: NONE



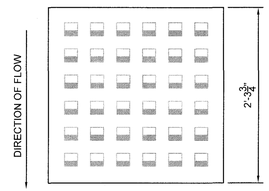
NOTES:
1. ALL PRE-CAST CONCRETE TO CONFORM TO ASTM C478.
2. MANHOLE RING AND COVER SHALL BE AS SPECIFIED.

TYPICAL STORM MANHOLE

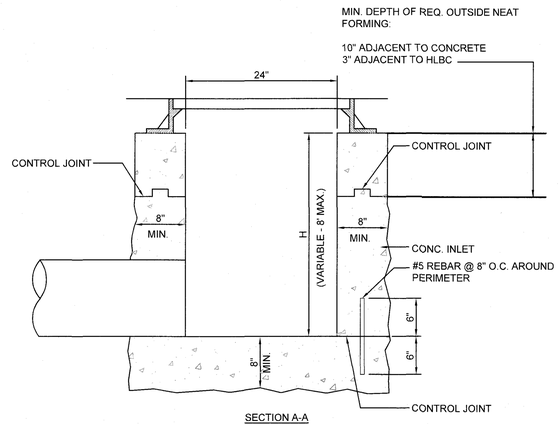
SCALE: NONE (0260502)



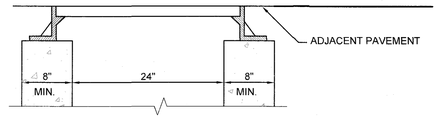
PLAN



TILT BAR GRATE



SECTION A-A
(W/ DEEP FRAME)



PARTIAL SECTION A-A
(W/ DEEP FRAME)

WV DOH TYPE B INLET

SCALE: 1"=1'-0" (0272022)

NOTES:

1. MANHOLE STEPS SHALL BE CAST IN PLACE REINFORCED PALYPROPLENE PLASTIC AS MANUFACTURED BY "AMERICAN STEP COMPANY" ML-10 "M.A. INDUSTRIES" PS1-PF FOR ALL MANHOLES.
2. MANHOLE FRAME AND LIDS SHALL BE HEAVY DUTY, BLACK ASPHALTIC COATED (DIPPED) "NEENAH" R-1642 OR EQUAL UNLESS OTHERWISE NOTED. LIDS SHALL BE STAMPED "SANTIARTY SEWER" WITH SELF SEALING GASKETS. MANHOLES DESIGNATED WITH A (WT) ON THE DRAWINGS IN THE PROFILE VIEWS, SHALL HAVE BE A BOLTED, GASKETED, WATERTIGHT CASTING "NEENAH" R-1915-S1 OR EQUAL PROVIDE (4) 1" DIA. BOLT HOLES IN ALL MANHOLE FRAME FOR MOUNTING TO CONCRETE MANHOLE. SET FRAME IN BED OF MORTAR AND BUTYL RUBBER SEALANT AND ANCHOR WITH (4) 5/8" DIA. STAINLESS STEEL EXPANSION ANCHORS. FOR LOCATIONS WHERE AN ASPHALT OVERLAY IS TO BE PROVIDED WITHOUT COLD-MILLING THE PAVEMENT, THE CONTRACTOR MAY INSTALL 1 ½" CAST IRON ADJUSTING RINGS AS MANUFACTURED BY "NEENAH" OR APPROVED EQUAL. FOLLOWING THE PALCEMENT OF THE OVERLAY, BOLTS FOR BOLTED LIDS SHALL BE OF SUFFICIENT LENGTH TO ACCOMMODATE HEIGHT OF ADJUSTING RINGS.
3. SHALLOW MANHOLES (LESS THAN 4'-0" IN DEPTH) SHALL USE FLAT SLAB TOP SECTIONS, UNLESS OTHERWISE NOTED.
4. ALL ECCENTRIC CONE SECTIONS LOCATED IN THE LIMITS OF CITY STREETS AND WVDOT ROADWAYS SHALL BE ROTATED SUCH THAT THE MANHOLE CASTINGS ARE AS NEAR THE CENTER OF THE DRIVING LANE AS POSSIBLE. FLAT SLAB MANHOLE SECTIONS IN CITY STREETS AND WVDOT ROADWAYS ARE NOT PERMITTED.
5. THE TOTAL MAXIMUM HEIGHT OF ADJUSTING RINGS SHALL BE 10". WHEN ADJUSTING THE ELEVATIONS OF THE FRAME TO CONFORM TO THE EXISTING GROUND OR PAVEMENT SLOPE, THE CONTRACTOR MAY UTILIZE MORTAR IN CONJUNCTION WITH BUTYL RUBBER SEALANT (MAX.2" THICKNESS).
6. THE INVERT ELEVATIONS SHOWN FOR PROPOSED MANHOLES ARE AT THE CENTER (OUT AND IN) OF THE MANHOLE BASE. THE RIM (TOP OF CASTING) ELEVATIONS SHOWN ON THE DRAWINGS HAVE NOT BEEN FIELD VERIFIED. THE CONTRATOR SHALL VERIFY ALL ANGLE, DISTANCE, AND DEPTH MEASUREMENTS (TOP OF CASTING AND NEVER) PRIOR TO ORDERING ANY MANHOLES OR INSTALLING ANY MATERIALS. SHOULD DISCREPANCIES EXIST, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
7. ALL MANHOLES SHALL BE TYPE A UNLESS NOTED OTHEWISE ON THE DRAWINGS.
8. THE TOP OF CASTING (RIM) SHALL BE FLUSH WITH THE GROUND OR PAVEMENT, UNLESS NOTED OTHERWISE ON THE DRAWINGS. WHEN IN NON-PAYMENT AND WOODED/NON-MOWED AREAS THE FINISHED GROUND SHALL BE SLOPED AWAY FROM THE CASTING IN ALL DIRECTIONS.
9. PROVIDE THREE (3) S. STL. STRAPS (3"X1/2"X1'-2") PLATE W/ (2) ½" S. STL. WEDGE ANCHOR BOLTS (2 ½" EMBEDMENT) 120° SEPARATION. PLACE TOP BOLT 5" ABOVE JOINT AND BOTTOM BOLT 7" BELOW JOINT. STRAPS SHALL BE USED WHEN A PORTION OF THE MANHOLE COME SECTION IS EXPOSED ABOVE GRADE, OR WHEN MANHOLE IS LOCATED IN A WATERWAY. THIS REQUIREMENT IS TYPICAL FOR ALL MANHOLE TYPES.
10. WHEN NEW MANHOLE IS BEING CONNECTED TO A SEWER PIPE THAT HAS BEEN LINED, THE CURED-IN PLACE LINER SHALL MAKE A TIGHT SEAL AT THE MANHOLE OPENING WITH NO ANNULAR GAPS. ANY ANNULAR GAPS AT THE END OF THE PIPE SHALL BE SEALED BY USING ACTIVATED OAKUM SOAKED IN URETHANE RESIN AND LATER COVERED WITH A HYDRAULIC CEMENTITIOUS MORTAR.
11. THE MAXIMUM EFLECTION OF THE FLEXIBLE WATERTIGHT CONNECTIONS AS GIVEN BY THE MANUFACTURER SHALL NOT BE EXCEEDED.
12. PRECAST CONCRETE ADJUSTING RINGS SHALL BE PRE-DRILLED OR CAST TO ACCOMMODATE ANCHOR BOLTS.
13. PROVIDE NOTCH IN ANTI-FLOATATION COLLAR BELOW THE MANHOLE OUTLET PIPE (DOWNSTREAM) OPENING TO ALLOW FOR PIPES INSTALLED AT STEEP GRADES TO CLEAR THE CONCRETE ANTI-FLOATATION COLLAR WITHOUT OBSTRUCTION.
14. WHERE PIPE STUBS ARE INDICATED ON THE DRAWINGS, THE STUB SHALL BE SDR35 PVC TERMINATED WITH A WATERTIGHT PLUG.
15. MANHOLE FOUNDATION TO BE A MINIMUM OF 6" COMPACTED LIMESTONE (#57 OR CLI AGGREGATE BASE)
16. CONCRETE INVERTS FROM PIPES FLOWING INTO A MANHOLE SHALL HAVE SWEEPING TURNS INTO THE FLOW CHANNEL.
17. ALL PRE-CAST CONCRETE TO CONFORM TO ASTM C478.
18. MANHOLE RING AND COVER SHALL BE AS SPECIFIED.
19. CONTRACTOR SHALL BE RESPONSIBLE FOR FOLLOWING ALL APPLICABLE LAWS AND CODES WITH REGARD TO SAFETY OF THE CONSTRUCTED MANHOLE.
20. PROVIDE MOUSEHOLE TYPE KNOCKOUTS IN BASE SECTION AT EXISTING PIPE PENETRATIONS WITH 3" CLEARANCE ALL AROUND OUTSIDE OF PIPE.
21. PROVIDE "Z-LOK" BOOTS AT ALL NEW PIPE PENETRATIONS.

REVISION NUMBER	REVISIONS	DATE	BY

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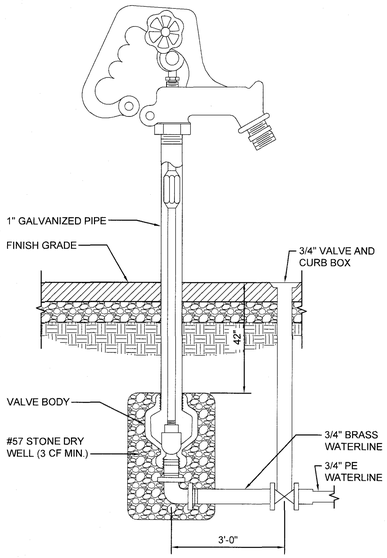
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

UTILITY DETAILS

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT ROGER J. KENNEDY No. 227 STATE OF WEST VIRGINIA
8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-505	△

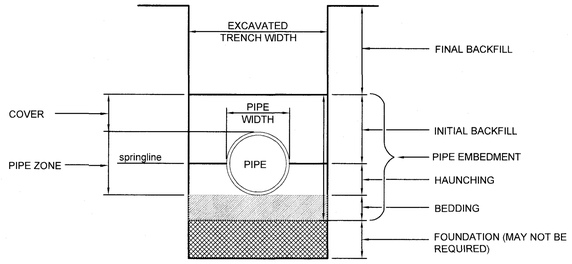
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GROUND HYDRANT DETAIL

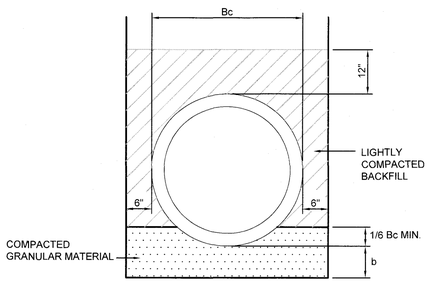
SCALE: NONE

NOTE: HYDRANT SHALL BE MURDOCK NON-FREEZE POST HYDRANT MODEL M-3904 OR APPROVED EQUAL.



PIPE EMBEDMENT DETAIL (SHOWN FOR TERMINOLOGY)

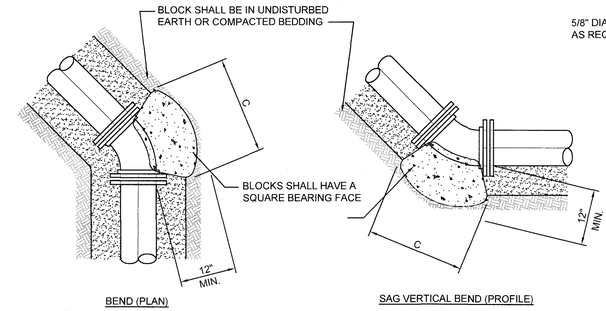
NOTE:
BEDDING THICKNESS UNDER PIPE BARREL, b, SHALL BE 1/8 Bc, 4" MIN., 6" MAX.

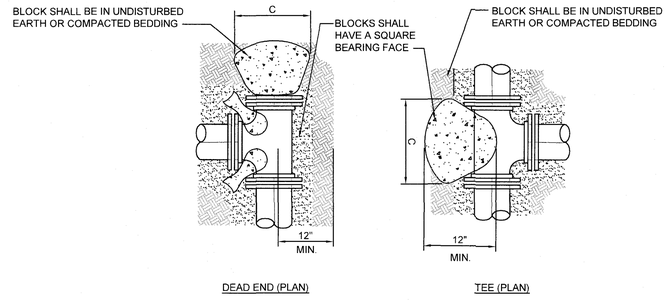


CLASS 'C' BEDDING GRANULAR

TRENCH BEDDING DETAILS

SCALE: NONE (0271006)





PIPE SIZE	90 DEG.			45 DEG.			22.5 DEG.			11.25 DEG.			TEE			DEAD END		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
4"	——	——	22"	35"	16"	28"	28"	12"	22"	22"	8"			22"			19"	
6"	——	——	32"	44"	44"	23"	35"	35"	17"	28"	28"	12"	——	——	32"	——	——	27"
8"	——	——	42"	53"	53"	31"	43"	43"	22"	34"	34"	16"	——	——	42"	——	——	35"
10"	——	——	51"	61"	61"	38"	49"	49"	27"	39"	39"	19"	——	——	51"	——	——	43"
12"	——	——	61"	68"	68"	45"	55"	55"	32"	43"	43"	23"	——	——	61"	——	——	51"
14"	——	——	71"	76"	76"	52"	60"	60"	37"	48"	48"	26"	——	——	71"	——	——	59"
16"	——	——	80"	82"	82"	59"	66"	66"	42"	52"	52"	30"	——	——	80"	——	——	67"
24"	——	——	119"	107"	107"	88"	86"	86"	63"	68"	68"	44"	——	——	119"	——	——	100"

THRUST BLOCK DIMENSIONS

NOTES:
1. INSTALL THRUST BLOCKING IN ACCORDANCE WITH THE FOLLOWING SCHEDULE FOR PIPES 4" AND LARGER AT ALL BENDS 11-1/4 DEGREES OR GREATER AT ALL TEES, CROSSES, REDUCERS, PLUGS AND OTHER FITTINGS.
2. CREST VERTICAL BEND BLOCK WIDTH SHALL BE 24" MIN. FOR 8" AND 10" PIPE.
3. LEAVE ALL FLANGES FREE AND CLEAR FOR MAINTENANCE.

* DIMENSIONS SHOWN ARE FOR 200 PSI WATER PRESSURE FOR DUCTILE IRON AND PVC PIPE WITH ALLOWABLE SOIL BEARING PRESSURE OF 2000 PSF.

* THRUST BLOCKING IS NOT REQUIRED FOR PIPE SMALLER THAN 4"

TYPICAL CONCRETE THRUST BLOCKING

SCALE: NONE

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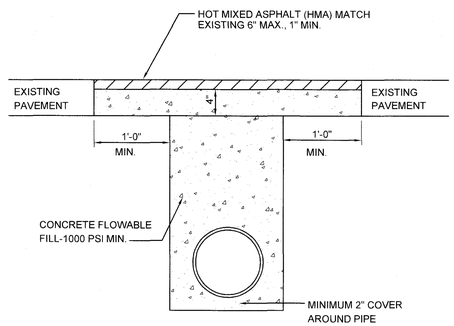
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

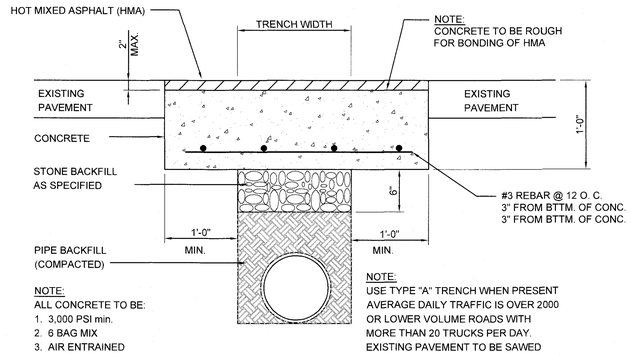
UTILITY DETAILS

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
11/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-506	

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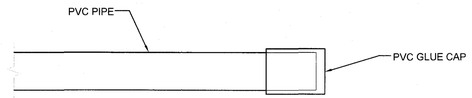




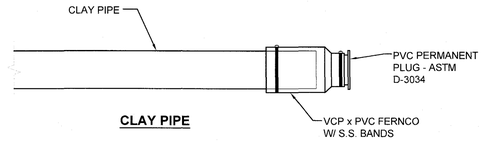
TYPE "A" TRENCH

PAVEMENT RESTORATION DETAILS

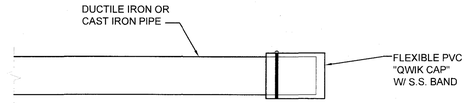
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PVC PIPE



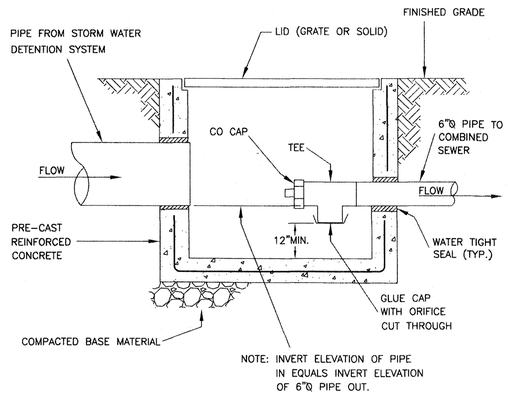
CLAY PIPE



CAST IRON OR DUCTILE IRON PIPE

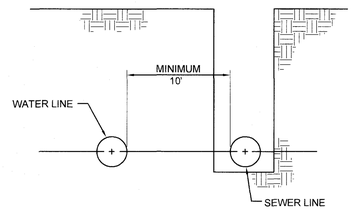
SEWER PIPE CAPPING DETAIL

SCALE: NONE



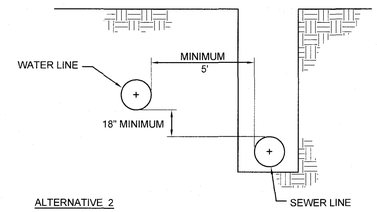
GRIT/GAS TRAP PIPING DETAIL

SCALE: NONE



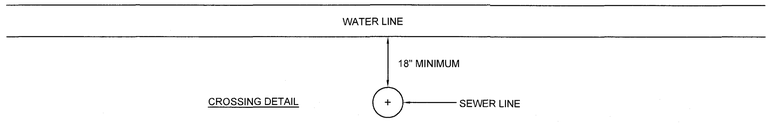
ALTERNATIVE 1

TO BE USED WHENEVER POSSIBLE



ALTERNATIVE 2

TO BE USED WHEN ALTERNATIVE 1 IS NOT POSSIBLE. SEWER LINE MUST BE CONSTRUCTED OF AWWA C-900 PIPE OR EQUAL.



CROSSING DETAIL

SEWER LINE - WATER LINE SEPARATION DETAILS

SCALE: NONE (0271004)

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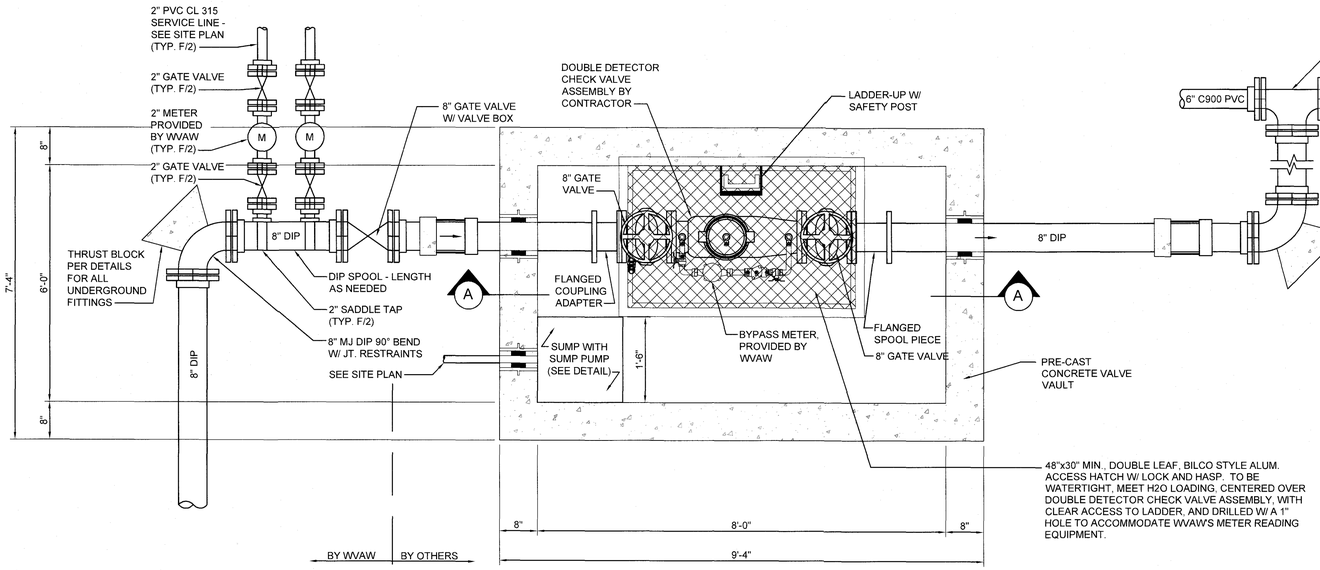
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

UTILITY DETAILS

SEAL
PROFESSIONAL LANDSCAPE ARCHITECT
ROGER J. KENNEDY
No. 237
STATE OF WEST VIRGINIA
9/9/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	LDA
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-507	△

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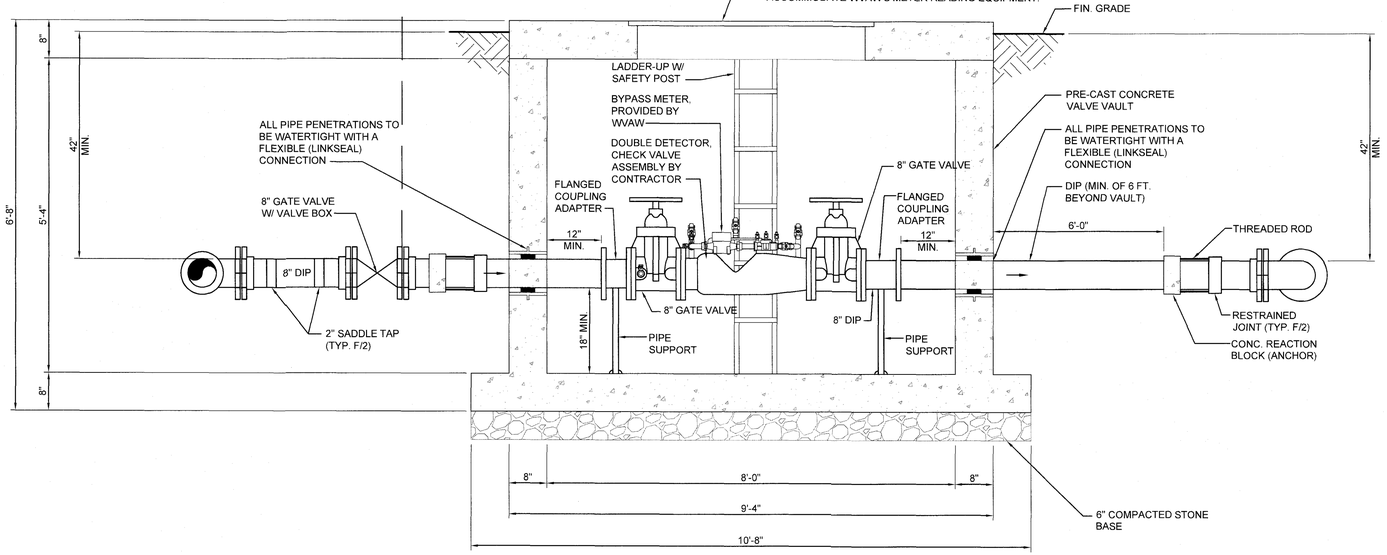


FIRE SERVICE VAULT PLAN

SCALE: NONE

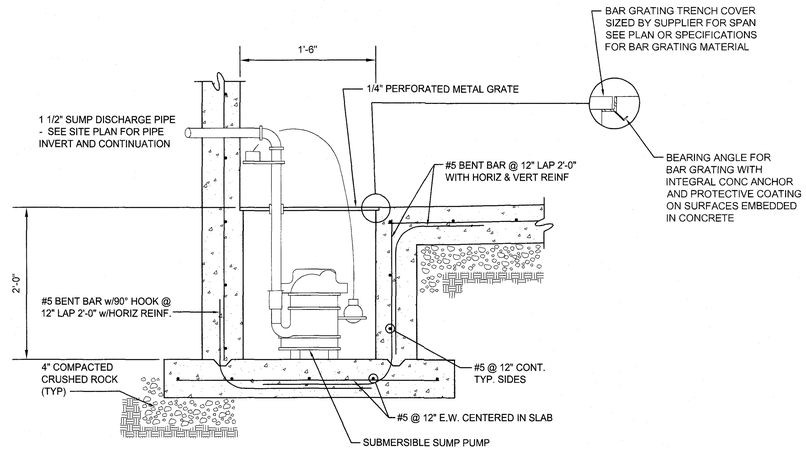
NOTES:

1. PRE-CAST CONCRETE SHALL CONFORM TO ASTM C-913, LATEST EDITION.
2. ALL PIPING AND FITTINGS SHALL BE FLANGED DUCTILE IRON PIPE (DIP) INSIDE VALVE VAULT, AND PUSH-ON JOINT DIP W/ MECHANICAL RESTRAINED JOINT FITTINGS OUTSIDE VAULT.
3. STAINLESS STEEL DOUBLE DETECTOR CHECK VALVE ASSEMBLY TO BE MANUFACTURED BY AMES OR WATTS AND INCLUDE BYPASS PORTS AS DIRECTED BY WVAW.
4. ALL DIP TO BE CL 52.
5. ALL VALVES TO BE RATED FOR 250 PSI.
6. VAULT WALL THICKNESS MAY VARY DEPENDING ON SITE/ENGINEERING CONDITIONS.
7. FOR OPERATING PRESSURES EXCEEDING DDCV ASSEMBLY MANUFACTURERS RECOMMENDED OPERATION, A UL RATED PRESSURE REDUCING VALVE IS RECOMMENDED PRIOR TO THE DDCV ASSEMBLY VAULT.
8. THIS DETAIL IS PROVIDED AS A GENERAL REPRESENTATION OF WV AMERICAN WATER CO. REQUIREMENTS AND IS NOT INTENDED TO BE USED FOR DESIGN OR CONSTRUCTION. IT IS REQUIRED THAT PROJECT DRAWINGS BE SUBMITTED DETAILING THE DESIGN OF THE FIRE SERVICE VAULT COMPLETE WITH DIMENSIONS AND SPECIFIED EQUIPMENT THAT MEET SPECIFIC PROJECT CONDITIONS FOR ACCEPTANCE OF CONFORMANCE WITH WV AMERICAN WATER REQUIREMENTS.
9. THIS DETAIL ONLY HIGHLIGHTS WVAW'S GENERAL GUIDELINES. THE OWNER AND THEIR REPRESENTATIVES ARE RESPONSIBLE FOR THE OVERALL INSTALLATION MEETING ALL FEDERAL, STATE, AND LOCAL LAWS/REGULATIONS.



FIRE SERVICE VAULT SECTION

A C-0-508 SCALE: NONE



SUBMERSIBLE SUMP PUMP DETAIL

SCALE: NONE

NOTES:

1. PUMPS SHALL BE NON-OVERLOADING THROUGHOUT THE CURVE.
2. ZOELLER, MODEL M53 USED AS BASIS OF DESIGN.
3. 19 GPM, TOTAL HEAD: 15, 3/10 HP, RPM 1550, HERMETICALLY SEALED SUBMERSIBLE MOTOR.

REVISION NUMBER	REVISIONS	DATE	BY

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

FIRE SERVICE VAULT

SEAL: ROBERT C. DENNIE REGISTERED 23341 PROFESSIONAL ENGINEER STATE OF WEST VIRGINIA

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KJW
DESIGNED BY:	RJK
CHECKED BY:	JEB
SHEET NO.	REVISION
C-0-508	

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GENERAL STRUCTURAL NOTES

1. THESE STRUCTURAL DRAWINGS ARE TO BE USED IN CONJUNCTION WITH ALL OTHER DRAWINGS, SPECIFICATIONS & CONTRACT DOCUMENTS.
2. THE DESIGN, CONSTRUCTION, QUALITY CONTROL AND SAFETY OF ALL WORK PERFORMED ON THE PROJECT SHALL CONFORM TO THE REFERENCED CODES AND STANDARDS, INCLUDING ALL SPECIFICATIONS REFERENCED WITH THE LATEST EDITIONS SHALL APPLY UNLESS NOTED.
3. BUILDING CODE - INTERNATIONAL BUILDING CODE - 2015
4. COUNTY/STATE — KANAWHA / WEST VIRGINIA
5. RISK CATEGORY — II
6. DEAD LOADS
   - ROOFS — PER MTL. BLDG MANUFACTURER
   - COLLATERAL (MTL. BLDG) — 10 PSF (MINIMUM)
7. DESIGN LIVE LOADS

ROOF LIVE LOAD	25 PSF MIN
ROOF SNOW LOAD	30 PSF
WAREHOUSE	500 PSF
SURPLUS/RECEIVING	250 PSF
TOOLS/STORE/OFFICE	100 PSF
SURPLUS/GROUNDS STORAGE	250 PSF
MECHANICAL ROOM	100 PSF
BREAK ROOM/OFFICE/TOILET ROOMS	60 PSF
MAINTENANCE SHOP	100 PSF
GROUNDS MECHANICS SHOP	100 PSF
MAIN FLOOR CORRIDORS	100 PSF

8. LATERAL LOADS - WIND

MAIN WIND FORCE RESISTING SYSTEM	STEEL SYSTEM NOT SPECIFICALLY DETAILED FOR SEISMIC/WIND RESISTANCE
BASIC WIND SPEED	115 MPH
EXPOSURE CATEGORY	C

9. LATERAL LOADS - SEISMIC

MAPPED SHORT PERIOD SPECTRAL RESPONSE ACCELERATION S_S	0.145g
MAPPED 1 SECOND SPECTRAL RESPONSE ACCELERATION S_1	0.07g
DESIGN SHORT PERIOD SPECTRAL RESPONSE ACCELERATION S_{DS}	0.155g
DESIGN 1 SECOND SPECTRAL RESPONSE ACCELERATION S_{D1}	0.111g
SEISMIC IMPORTANCE FACTOR I_e	1.0
SOIL SITE CLASS	D
SEISMIC DESIGN CATEGORY	B
BASIC SEISMIC FORCE RESISTING SYSTEM	STEEL SYSTEM NOT SPECIFICALLY DETAILED FOR SEISMIC/WIND RESISTANCE

10. ALL CONTRACTOR PROPOSED STRUCTURAL SUBSTITUTIONS, INCLUDING CONCRETE ADDITIVES, SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ANY PERTINENT WORK AND PRIOR TO THE AWARD OF A SUBCONTRACTOR.
11. SHOP DRAWINGS, TEST REPORTS, AND CERTIFICATIONS ARE REQUIRED FOR THE FOLLOWING STRUCTURAL ITEMS:
    - A. CONCRETE CYLINDER TESTS
    - B. CONCRETE MIX DESIGNS
    - C. GROUT MIX DESIGNS
    - D. REINFORCING STEEL SHOP DRAWINGS
    - E. MISCELLANEOUS AND STRUCTURAL STEEL SHOP DRAWINGS
    - F. METAL BUILDING LOADS AND DETAILS (SEALED BY A WV PE)
    - G. PALLET STORAGE RACK DESIGN AND ANCHORAGE TO FLOOR SLAB (SEALED BY A WV PE) *

* THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR HIGH-PILED PALLET RACK SYSTEMS. HIGH PILE PALLET RACK SYSTEMS AND THEIR ANCHORAGE MUST BE STAMPED BY A WV LICENSED ENGINEER, PROVIDED IN ACCORDANCE WITH ANSI MH16.1 2012 AND SHALL BE BASED ON THE OWNERS STORAGE NEEDS. THE CONTRACTOR SHALL PROVIDE EVERYTHING REQUIRED FOR INSTALLATION OF FREE STANDING PALLET RACK SYSTEMS INCLUDING BUT NOT LIMITED TO: PALLET RACK FRAMES, BEAMS, FOOT PLATES, SHIMS, POST PROTECTORS, CORNER PROTECTORS, END AISLE PROTECTORS, WIRE SHELF PANELS, PALLET SUPPORTS, PALLET SAFETY STOPS, ROW SPACERS, BRACING, AND ANCHORAGE. THE PALLET RACKS MAY BE BRACED TO EACH OTHER, BUT MAY NOT BE BRACED TO METAL BUILDING WALLS OR STRUCTURE.

THE SHOP DRAWINGS SPECIFIED BY THE ENGINEER ARE AN INTEGRAL PART OF THE COMPLETE DESIGN. THEY SERVE AS BOTH A CHECK ON THE CONTRACTOR'S INTERPRETATION OF THE ENGINEER'S DRAWINGS AND SPECIFICATIONS AND AS A FINAL CHECK ON THE COORDINATED, DETAILED DESIGN PRIOR TO CONSTRUCTION. THEREFORE, ANY MATERIAL ORDERED OR WORK PERFORMED PRIOR TO THE ENGINEER'S REVIEW AND APPROVAL OF THE SHOP DRAWINGS ARE DONE AT THE CONTRACTOR'S SOLE FINANCIAL RISK. THIS MEANS THAT WHERE DIFFERENCES OF INTERPRETATION EXIST, WORK DONE PRIOR TO THE APPROVAL OF THE SHOP DRAWINGS THAT IS ADJUDGED BY THE ENGINEER TO BE NOT IN CONFORMANCE WITH THE SPECIFICATIONS MAY BE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTORS SOLE EXPENSE. AT A MINIMUM, WHERE REASONABLE ADDITIONS TO THE WORK ARE INDICATED ON THE SHOP DRAWINGS, THE ADDITIONAL COST OF THE REMOVAL AND REWORK THAT WOULD NOT HAVE BEEN REQUIRED HAD THE CONTRACTOR NOT PROCEEDED PRIOR TO SHOP DRAWING APPROVAL SHALL BE AT THE CONTRACTOR'S SOLE EXPENSE.

12. CONSTRUCTION METHODS, PROCEDURES, AND SEQUENCES ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEANS TO MAINTAIN AND PROTECT THE STRUCTURAL INTEGRITY OF ALL CONSTRUCTION AT ALL STAGES.
13. COORDINATION WITH THE ARCHITECTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS TO VERIFY THE LOCATIONS AND SIZES OF ALL CHASES, INSERTS, OPENINGS, SLEEVES, FINISHES, DEPRESSIONS, AND OTHER PROJECT REQUIREMENTS ARE THE CONTRACTOR'S RESPONSIBILITY. ALL REQUIRED OPENINGS, SLEEVES, OR OTHER COMPONENTS MAY NOT BE SHOWN ON THE STRUCTURAL DRAWINGS.
14. IMPOSED CONSTRUCTION LOADS, INCLUDING CRANE LOADS, IN EXCESS OF THE STATED DESIGN LOADS MUST BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO THE IMPOSITION OF SUCH LOADS.
15. IMPLEMENTING JOB SITE SAFETY AND CONSTRUCTION PROCEDURES ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
16. IN CASE OF CONFLICT BETWEEN THE GENERAL NOTES, DETAILS AND SPECIFICATIONS, THE MOST RIGID REQUIREMENTS SHALL GOVERN.

AUGER CAST PILE

1. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING CODES AND STANDARDS:
   "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318", AMERICAN CONCRETE INSTITUTE
   "ACI MANUAL OF CONCRETE PRACTICE - PARTS 1 THROUGH 5", LATEST EDITION
   "MANUAL OF STANDARD PRACTICE", CONCRETE REINFORCING INSTITUTE
   CEMENT ASTM C150: TYPE I / II
   AGGREGATES ASTM C33 NORMAL WEIGHT
   DEFORMED REINFORCING BARS ASTM A615, GRADE 60
   GROUT FLUIDIFIER ASTM C937
   PILES UNDER STATIC AXIAL COMPRESSIVE LOAD ASTM D1143
2. AUGER CAST PILES SHALL BE INSTALLED PER LOCATIONS SHOWN ON THE DRAWINGS.
3. REFER TO GEOTECHNICAL REPORT FOR ADDITIONAL REQUIREMENTS RELATED TO AUGER CAST PILES CONSTRUCTION.
4. GROUT STRENGTH: 4,000 PSI 28-DAY COMPRESSIVE STRENGTH
5. TOTAL GROUT VOLUME IN EACH PILE SHALL BE AT LEAST 120 PERCENT OF THE THEORETICAL "NEAT" PILE VOLUME
6. A BOTTOM DISCHARGE BIT SHALL BE USED IN LIEU OF A SIDE DISCHARGE BIT, THE HOLE IN THE BOTTOM OF THE BIT SHALL BE CLOSED WHILE THE AUGER IS ADVANCED. THE PLUG SHALL BE REMOVED BY THE REBAR PLACEMENT PRIOR TO GROUTING.
7. CLOSE INSPECTION BY GEOTECHNICAL PERSONNEL IS REQUIRED DURING PILE INSTALLATION TO MONITOR PLUMBNESS, GROUTING PROCEDURES AND TO SAMPLE GROUT, MONITOR AUGER WITHDRAWAL RATE DURING GROUTING AND PLACEMENT OF REINFORCING.
8. LOAD TEST PILES AS INDICATED IN THE SPECIFICATIONS.

GENERAL FOUNDATION/GEOTECHNICAL NOTES

1. THE SOILS REPORT, PREPARED BY TERRACON CONSULTANTS, INC., DATED 07/23/20, IS ON FILE WITH THE OWNER AND A COPY IS AVAILABLE FOR EXAMINATION AT THE OFFICE OF THE STRUCTURAL ENGINEER.
2. THE SOIL BEARING VALUE OF CONVENTIONAL SPREAD FOOTINGS (AFTER OVER-EXCAVATION AND BACKFILL REQUIREMENTS ARE MET) IS 2,000 PSF, AS RECOMMENDED BY TERRACON CONSULTANTS, INC.
3. AFTER PERFORMING THE INITIAL SITE PREPARATION ACTIVITIES, THE EXPOSED SOILS WITHIN THE LIMITS OF THE PROPOSED STRUCTURE(S) AND PAVEMENT AREAS SHALL BE PROOFROLLED IN THE PRESENCE OF A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER. THE EXPOSED SUBGRADE SHALL BE PROOFROLLED WITH A LOADED TANDEM-AXLE DUMP TRUCK OR OTHER HEAVY, RUBBER-TIRED CONSTRUCTION EQUIPMENT WEIGHING AT LEAST 20-TONS TO LOCATE ANY ZONES THAT ARE SOFT OR UNSTABLE. WHERE SOFT OR UNSTABLE AREAS ARE ENCOUNTERED, UNDERCUT SHALL EXTEND UNTIL FIRM MATERIAL IS ENCOUNTERED OR TO A LEVEL DETERMINED TO BE ACCEPTABLE BY THE GEOTECHNICAL ENGINEER. SEE GEOTECHNICAL REPORT FOR ADDITIONAL REQUIREMENTS REGARDING SITE PREPARATION.
4. VERIFY LOCATIONS OF COLUMNS, UNDERGROUND UTILITIES, ETC., WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND CIVIL DRAWINGS PRIOR TO PLACEMENT OF FOUNDATIONS.
5. THE BOTTOM OF ALL EXTERIOR FOOTINGS SHALL EXTEND A MINIMUM OF 3'-0" BELOW FINISHED GRADE.
6. ALL FOUNDATION AND SLAB-ON-GRADE SUB GRADES ARE TO BE FIELD INSPECTED BY AN EXPERIENCED QUALIFIED GEOTECHNICAL ENGINEER TO VERIFY THAT THE ALLOWABLE BEARING PRESSURE IS ACHIEVED AND THAT THE SUB GRADES ARE SUITABLE FOR SUPPORT OF THE FOUNDATIONS AND SLAB-ON-GRADE. THE GEOTECHNICAL ENGINEER SHALL ALSO VERIFY FOUNDATION ELEVATIONS PRIOR TO PLACEMENT OF FOUNDATION ELEMENTS, AND VERIFY ALL SUBGRADES PRIOR TO BACKFILL.
7. UNLESS DETERMINED OTHERWISE BY GEOTECHNICAL EVALUATION, FILL MATERIAL FOR SLAB AND FOOTING AREAS SHALL BE PLACED IN LAYERS NOT EXCEEDING 8 INCHES (UNCOMPACTED THICKNESS) AND COMPACTED TO 98% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698. CRUSHED STONE BACKFILL SHALL BE COMPACTED WITH HAND EQUIPMENT TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.
8. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO BRACE FOUNDATION WALLS WHEN BACK FILLING AND WHEN THERE IS A POSSIBILITY OF DAMAGE BY EXCESS WATER.
9. COMPACTION OF BACKFILL WITHIN 2 FEET OF FOUNDATION WALLS SHALL BE ACCOMPLISHED WITH HAND EQUIPMENT. WHERE FILL IS REQUIRED ON BOTH SIDES OF FOUNDATION WALL, BRING THE FILL UP EACH SIDE SIMULTANEOUSLY AND UNIFORMLY.
10. THE SURFACE AREA ADJACENT TO THE FOUNDATION WALL SHALL BE PROVIDED WITH ADEQUATE DRAINAGE AND SHALL BE GRADED SO AS TO DRAIN SURFACE WATER AWAY FROM FOUNDATION WALLS.
11. IF FOOTING EXCAVATIONS ENCOUNTER ISOLATED AREAS OF RELATIVELY HARD ROCK AT OR ABOVE THE PLANNED FOOTING ELEVATIONS, THE ROCK SHALL BE OVER EXCAVATED TO A DEPTH OF APPROXIMATELY ONE FOOT BELOW THE FOUNDATION BEARING ELEVATION AND BACKFILLED WITH STRUCTURAL FILL.
12. FOUNDATIONS SHALL NOT BE PLACED ON MUD OR MUCK, SOFT OR LOOSE SOIL, IN STANDING WATER OR ON FROZEN GROUND.
13. ALL NON-CANTILEVER WALLS SHALL BE BE ADEQUATELY BRACED PRIOR TO BACKFILL.
14. CANTILEVER RETAINING WALLS SHALL NOT BE BACKFILLED UNTIL THE CONCRETE HAS DEVELOPED 100% OF THE REQUIRED 28-DAY COMPRESSIVE STRENGTH FOR THE CLASS OF CONCRETE SPECIFIED.

PRE-ENGINEERED METAL BUILDINGS

1. DESIGN OF PRE-ENGINEERED METAL BUILDING SHALL BE IN ACCORDANCE WITH PROCEDURES SET FORTH IN MBMA'S "METAL BUILDING SYSTEMS MANUAL."
2. DESIGN LOADS SHALL BE AS INDICATED ON THESE DRAWINGS AND IN ACCORDANCE WITH ASCE 7, "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES" AND THE INTERNATIONAL BUILDING CODE, 2015, COORDINATE COLLATERAL LOAD DESIGN REQUIREMENTS WITH G.C., SUBCONTRACTORS AND EQUIPMENT SHOWN ON DRAWINGS U.N.O.
3. ALL COLUMN BASES SHALL BE DESIGNED AS PINNED BASE. NO FIXED BASE DESIGNS ARE PERMITTED.
4. FOUNDATION SIZES INDICATED ON THE DRAWINGS ARE FOR PRICING ONLY AND ARE BASED ON PRELIMINARY REACTIONS. CONTRACTOR SHALL PROVIDE COLUMN REACTIONS TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR REVIEW PRIOR TO BEGINNING FABRICATION OF THE BUILDING AND FINAL FOUNDATION DESIGN.
5. COORDINATE ALL PENETRATIONS THROUGH ROOF WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL AND PLUMBING DRAWINGS AND ALL TRADES.
6. PROVIDE TEMPORARY SHORES, GUYS, BRACES AND OTHER SUPPORTS DURING ERECTION TO KEEP STRUCTURAL FRAMING SECURE, PLUMB, AND IN ALIGNMENT AGAINST TEMPORARY CONSTRUCTION LOADS AND LOADS EQUAL IN INTENSITY TO DESIGN LOADS. REMOVE TEMPORARY SUPPORTS WHEN PERMANENT STRUCTURAL FRAMING, CONNECTIONS, AND BRACING ARE IN PLACE, UNLESS OTHERWISE INDICATED. COMPLY WITH ALL LOCAL, STATE, FEDERAL AND OSHA REGULATIONS PERTAINING TO ERECTION OF METAL BUILDING.
7. COORDINATE ROOF TOP MECHANICAL UNIT LOCATIONS AND WEIGHTS WITH ARCHITECTURAL/MECHANICAL DRAWINGS.

SPECIAL INSPECTION

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE AND SCHEDULE THE SPECIAL INSPECTOR'S INSPECTIONS AND TESTING FOR THE WORK NOTED BELOW AND IN THE SPECIAL INSPECTIONS SPECIFICATION. THE FOLLOWING INFORMATION IS PROVIDED FOR THE CONTRACTOR'S INFORMATION AND COORDINATION PURPOSES.
2. SPECIAL INSPECTIONS SHALL BE PERFORMED FOR THE FOLLOWING WORK AS REQUIRED IN THE 2015 INTERNATIONAL BUILDING CODE:
   - 2.1. STEEL CONSTRUCTION IN ACCORDANCE WITH SECTION 1705.02.
   - 2.2. CONCRETE CONSTRUCTION IN ACCORDANCE WITH SECTION 1705.3
   - 2.3. SOILS CONSTRUCTION IN ACCORDANCE WITH SECTION 1705.6
   - 2.4. CAST-IN-PLACE DEEP FOUNDATION CONSTRUCTION IN ACCORDANCE WITH SECTION 1705.8
3. THE TYPE AND EXTENT OF EACH TEST AND INSPECTION REQUIRED FOR EACH TYPE OF WORK SHALL BE AS INDICATED IN THE BUILDING CODE AND THE REFERENCES INCORPORATED THEREIN.
4. SPECIAL INSPECTION SERVICES SHALL BE CONTRACTED AND PAID FOR BY THE CONTRACTOR.
5. WORK REQUIRING SPECIAL INSPECTION SHALL BE INSPECTED BY THE SPECIAL INSPECTOR FOR CONFORMANCE WITH THE APPROVED DRAWINGS AND SPECIFICATIONS. INSPECTION REPORTS INDICATING THE RESULTS OF SPECIAL INSPECTIONS SHALL BE PROMPTLY SUBMITTED TO THE CONTRACTOR, THE ARCHITECT, AND THE STRUCTURAL ENGINEER.
6. ALL SPECIAL INSPECTIONS INDICATING NON-CONFORMING WORK SHALL BE REPORTED IMMEDIATELY TO THE CONTRACTOR, THE ARCHITECT AND THE STRUCTURAL ENGINEER. IMPENDING CONSTRUCTION WORK THAT WOULD IMPEDE ECONOMICAL CORRECTION OF NON-CONFORMING WORK SHALL NOT PROCEED WITHOUT WRITTEN APPROVAL.
7. A FINAL REPORT DOCUMENTING COMPLETION OF ALL REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY NON-CONFORMING WORK NOTED IN THE INSPECTIONS SHALL BE SUBMITTED BY THE SPECIAL INSPECTOR AT THE COMPLETION OF THE PROJECT. FINAL REPORT SHALL IDENTIFY ALL NON-CONFORMING WORK AND DISCUSS REMEDIATION THAT OCCURRED.
8. SPECIAL INSPECTION SHALL BE PERFORMED BY A QUALIFIED INSPECTION AND TESTING AGENCY APPROVED BY THE BUILDING OFFICIAL, THE ARCHITECT, AND THE STRUCTURAL ENGINEER.
9. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION WITH REGARDS TO SPECIAL INSPECTOR AND CONTRACTOR RESPONSIBILITIES.

CAST-IN-PLACE CONCRETE

1. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING CODES AND STANDARDS:
   "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318-11", AMERICAN CONCRETE INSTITUTE
   "ACI MANUAL OF CONCRETE PRACTICE - PARTS 1 THROUGH 5", LATEST EDITION
   "MANUAL OF STANDARD PRACTICE", CONCRETE REINFORCING STEEL INSTITUTE
   ACI 305 AND ACI 306 FOR HOT AND COLD WEATHER CONCRETE CONSTRUCTION
2. CONTRACTOR SHALL PROVIDE MATERIALS WHICH COMPLY WITH THE FOLLOWING ASTM REQUIREMENTS, AS REQD.:

CEMENT	ASTM C150: TYPE I/II
AGGREGATES	ASTM C33
FLY ASH	ASTM C618
PLAIN REINFORCING BARS	ASTM A615, GRADE 60
WELDABLE REINFORCING BARS	ASTM A706, GRADE 60
WELDED WIRE FABRIC	ASTM A1064
AIR-ENTRAINING ADMIXTURE:	ASTM C260

3. CONCRETE PROTECTION FOR REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE FOLLOWING TABLE, U.N.O. ON THE CONSTRUCTION DRAWINGS:

APPLICATION	COVER
- CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH:	3"
- CONCRETE EXPOSED TO WEATHER (U.N.O.):	
#6 THROUGH #18 BARS:	2"
#5 BAR, W31 OR D31 WIRE AND SMALLER:	1-1/2"
- CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND SLABS, WALLS, AND JOISTS:	
#14 AND #18 BARS:	1-1/2"
#11 BAR AND SMALLER:	3/4"

4. CONCRETE MIXES SHALL BE AS FOLLOWS:

APPLICATION	COMP. STRENGTH, AIR, W/C
- CONCRETE USED FOR FOUNDATION CONSTRUCTION (STRIP/SPREAD FOOTINGS, GRADE BEAMS, FOUNDATION WALLS ETC.), OR CONCRETE EXPOSED TO CYCLES OF FREEZE THAW (SIDEWALKS, EXTERIOR SLAB ON GRADE ETC.):	4,500 PSI, 6%, 0.45
- INTERIOR SLAB ON GRADE:	4,000 PSI, NONE, 0.50

5. SHOP DRAWINGS SHOWING THE SIZE, LENGTH, QUANTITY, LOCATION AND MARK OF ALL REINFORCING BARS, SUPPORTS AND ACCESSORIES SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FABRICATION.
6. MIX DESIGNS AND ADMIXTURE PRODUCT DATA SHALL BE SUBMITTED FOR APPROVAL PRIOR TO ORDERING CONCRETE.
7. THE TYPICAL DETAILS, PLANS, AND SECTIONS ON THESE DRAWINGS CONTAIN ADDITIONAL GENERAL CONCRETE CONSTRUCTION NOTES AND INFORMATION.
8. ALL CONCRETE SHALL BE REINFORCED UNLESS NOTED OTHERWISE.
9. REINFORCING STEEL SHALL BE CLEAN OF ALL DIRT AND OILS PRIOR TO CONCRETE POUR UNLESS SPECIFIED OTHERWISE.
10. SUPPORTS TO ADEQUATELY POSITION REINFORCING BARS DURING CONSTRUCTION SHALL BE INSTALLED.
11. FOUNDATION DOWELS OF THE SAME SIZE AND SPACING AS VERTICAL STEEL SHALL BE INSTALLED FOR ALL WALLS, PIERS, AND COLUMNS.
12. ALL REINFORCING AT WALL AND FOOTING CORNERS AND INTERSECTIONS SHALL BE CONTINUOUS BY THE USE OF BENT BARS OR CORNER BARS UNLESS INDICATED OTHERWISE.
13. CONSTRUCTION JOINTS SHALL BE POSITIONED SO AS NOT TO ADVERSELY AFFECT THE STRUCTURAL PERFORMANCE. CONSTRUCTION JOINT LOCATIONS NOT INDICATED ON THE STRUCTURAL DRAWINGS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.
14. PIPE SLEEVES AND INSERTS SHALL BE INSTALLED IN CONCRETE WORK AT ALL PENETRATIONS. PENETRATIONS OF BEAMS, JOISTS, COLUMNS OR STRUCTURAL SLABS NOT INDICATED ON THE STRUCTURAL DRAWINGS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.
15. ONLY WELDABLE REINFORCING BARS MAY BE WELDED.
16. ADMIXTURES CONTAINING CHLORIDE OR OTHER CORROSIVE CHEMICALS SHALL NOT BE USED IN CONCRETE.
17. AGGREGATES SHALL BE FREE OF DELETERIOUS OR NON-DURABLE MATERIALS SUCH AS CHERTS.
18. REINFORCING SHALL BE ADEQUATELY TIED AND SUPPORTED TO HOLD IT IN THE CORRECT POSITION DURING CONSTRUCTION AND THE PLACEMENT OF CONCRETE.
19. CONCRETE SHALL BE CONSOLIDATED ADEQUATELY DURING PLACEMENT BY MECHANICAL VIBRATION IN ACCORDANCE WITH PUBLISHED PRACTICES.
20. PLASTIC CHAIRS SHALL BE USED IN ALL CONCRETE THAT WILL BE EXPOSED TO VIEW IN THE COMPLETED STRUCTURE.
21. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED MINIMUM ¾", OR AS INDICATED ON THE STRUCTURAL/ARCHITECTURAL DRAWINGS.
22. FILL POCKETS AROUND CONNECTIONS WITH CONCRETE FLUSH AND SMOOTH UNLESS INDICATED OTHERWISE.
23. FORMED SURFACES SHALL HAVE A SMOOTH-FORM FINISH WHERE EXPOSED TO VIEW AND A ROUGH-FORM FINISH WHERE NOT EXPOSED TO VIEW UNLESS INDICATED OTHERWISE.
24. UNFORMED SURFACES SHALL HAVE A TROWEL FINISH WHERE EXPOSED TO VIEW AND A FLOAT FINISH WHERE NOT EXPOSED TO VIEW U.N.O. EXCEPT THAT STAIRS AND EXTERIOR WALKING SURFACES SHALL HAVE A BROOM FINISH U.N.O.
25. SLABS-ON-GRADE SHALL BE PLACED ON A VAPOR BARRIER.
26. ALL COLD JOINTS SHALL BE ROUGHENED TO A FULL AMPLITUDE OF ¼" AND A CONCRETE BONDING AGENT SHALL BE APPLIED PRIOR TO THE PLACEMENT OF FRESH CONCRETE.
27. IN SLABS-ON-GRADE, LAP WELDED WIRE FABRIC TWO FULL MESH PANELS AND WIRE TOGETHER.
28. SPLICE LAP LENGTHS FOR REINFORCING SHALL BE IN ACCORDANCE WITH THE FOLLOWING TABLE, U.N.O. ON THE PLANS:

BAR SIZE	LAP LENGTH
#3	24"
#4	36"
#5	48"
#6-#8	60"

29. PROVIDE ISOLATION JOINTS IN SLABS AS FOLLOWS:
    - A. BETWEEN SLABS-ON-GRADE AND FOUNDATION WALLS
    - B. BETWEEN SLABS AND INSERTS SUCH AS PIPES
    - C. AROUND STEEL COLUMNS AT SPREAD FOOTINGS

REVISION NUMBER	REVISIONS	DATE	BY

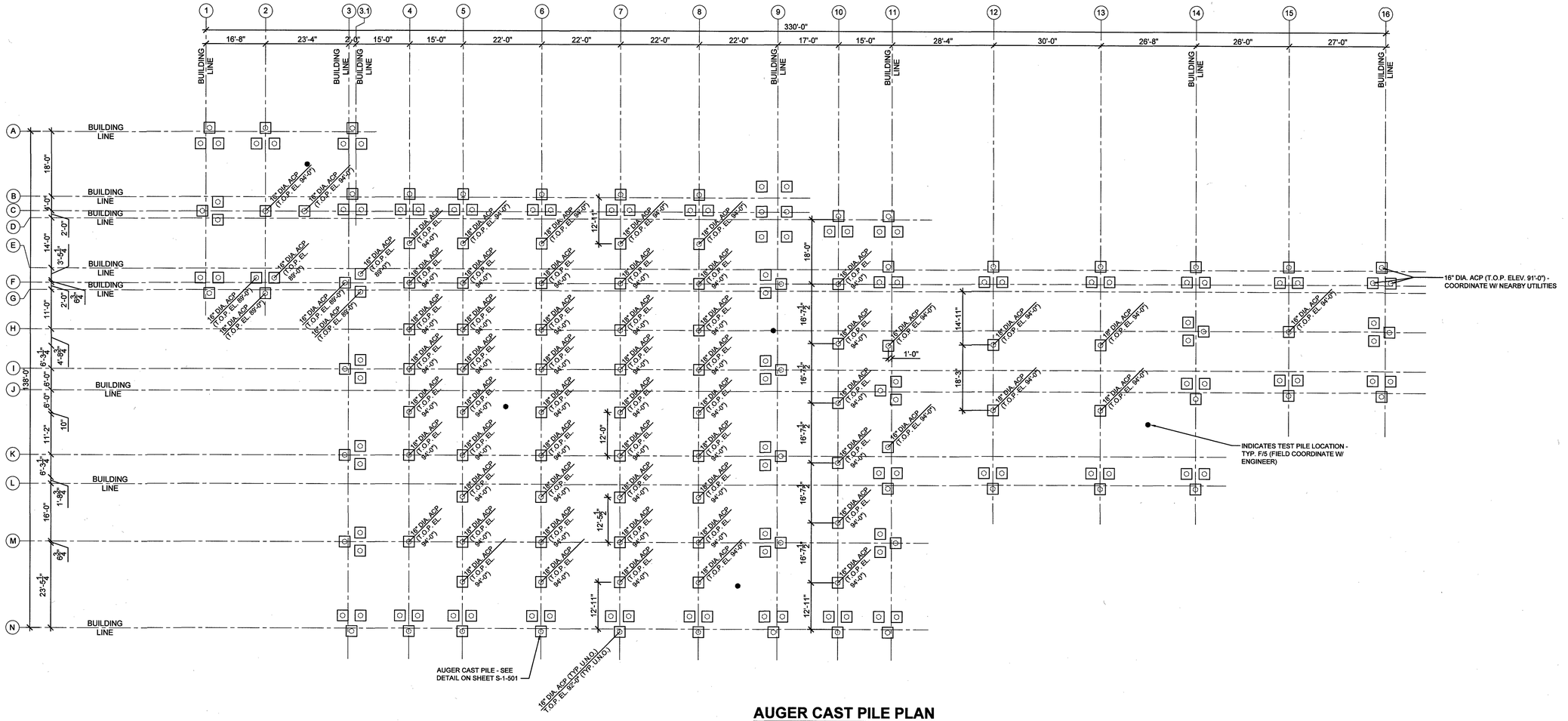
Chapman Technical Group, a division of GRW
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

STRUCTURAL GENERAL NOTES

SEAL: DAVE HOY, REGISTERED, 19186, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER, 4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	S-0-001
REVISION	△

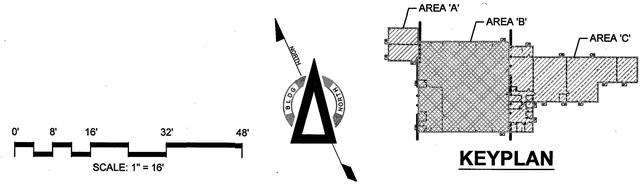


AUGER CAST PILE PLAN

SCALE: 1/16" = 1'-0"

NOTES:

1. PILES SHALL BE DRILLED TO PILE TIP ELEVATIONS INDICATED ON THE AUGER CAST PILE DETAIL - SEE SHEET S-1-501.
2. PILES SHALL BE SPACED AS INDICATED. PILES SHALL NOT BE INSTALLED WITHIN 6 PILE DIAMETERS CENTER-TO-CENTER OF A PILE FILLED WITH GROUT LESS THAN 24-HOURS OLD.
3. THE TOTAL GROUT VOLUME IN EACH PILE SHALL BE AT LEAST 120% OF THE THEORETICAL "NEAT PILE VOLUME".
4. SEE PROJECT SPECIFICATIONS, GEOTECHNICAL REPORT AND SHEET S-0-001 FOR ADDITIONAL INFORMATION AND REQUIREMENTS FOR AUGER CAST PILE CONSTRUCTION.
5. SEE SHEET S-1-101 FOR FOOTING SCHEDULE AND FOUNDATION PLAN.
6. LOAD TEST PILES AS INDICATED IN THE SPECIFICATIONS AND AT THE LOCATIONS SHOWN. COORDINATE W/ THE ENGINEER.
7. AUGER CAST PILE LAYOUT AND QUANTITY IS FOR CONTRACTOR ESTIMATING PURPOSES ONLY. FINAL LAYOUT WILL BE PROVIDED W/ APPROVED METAL BUILDING SHOP DRAWINGS.



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

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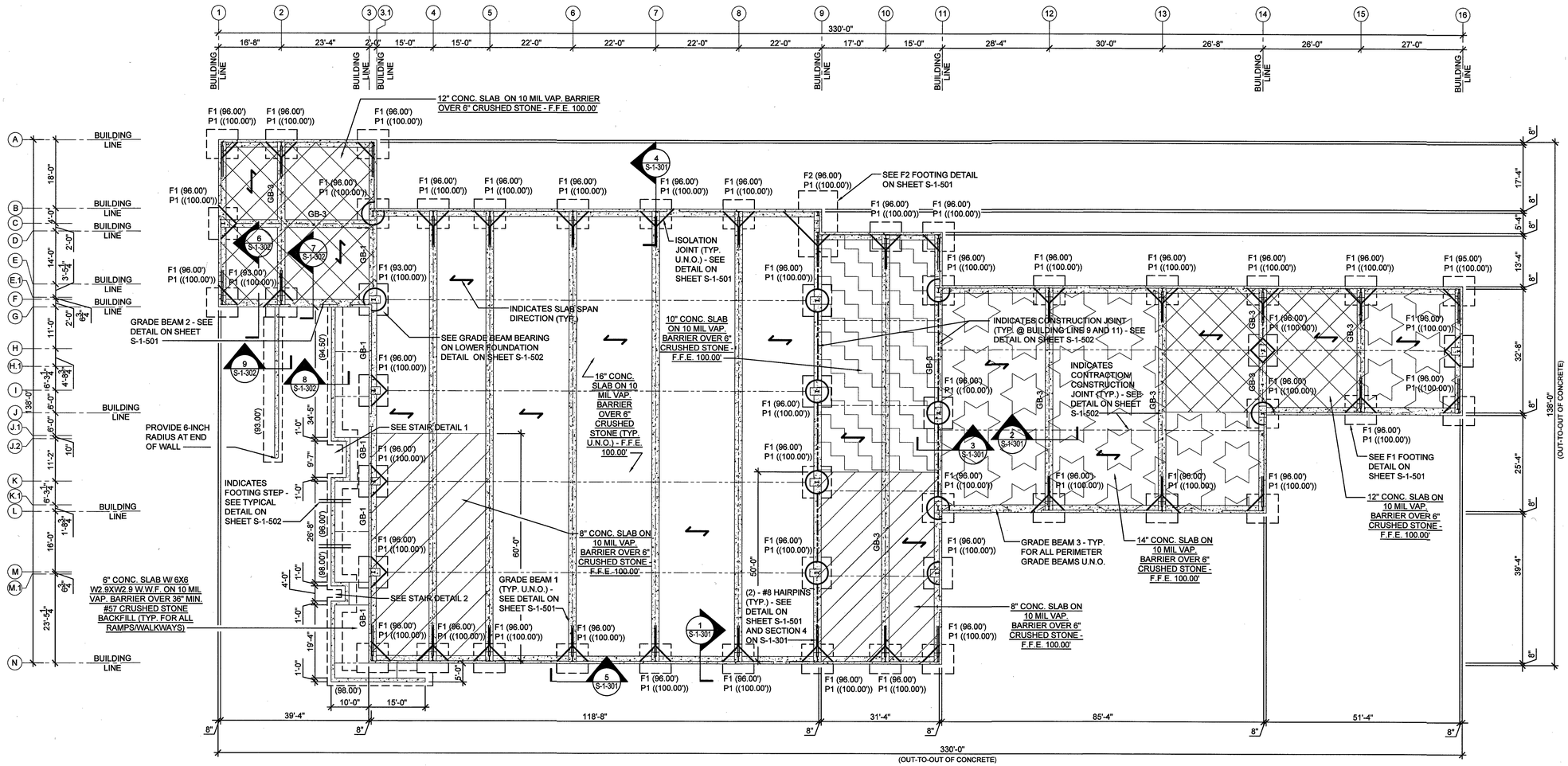
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
AUGER CAST PILE PLAN

SEAL
DAVE HOY
REGISTERED
19186
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
3/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	S-1-100
REVISION	△



FOUNDATION PLAN

SCALE: 1/16" = 1'-0"

NOTES:

1. TYPICAL COLUMN PIERS, FOUNDATION SIZES, AND DETAILS THAT PERTAIN TO THE METAL BUILDING ARE FOR CONTRACTOR ESTIMATING PURPOSES ONLY AND HAVE BEEN DESIGNED BASED ON PRELIMINARY LOADING INFORMATION. CONTRACTOR SHALL SUBMIT FINAL METAL BUILDING REACTIONS TO STRUCTURAL ENGINEER FOR FINAL FOUNDATION DESIGN AND ANCHOR BOLT EMBEDMENT. CONTRACTOR SHALL ASSUME A MINIMUM ANCHOR BOLT EMBEDMENT OF 40-INCHES.
2. TOP OF FOOTING ELEVATION INDICATED THUS (') ON PLAN. TOP OF PIER ELEVATION INDICATED THUS ((')) ON PLAN. F.F.E. 100.00'. COORDINATE TOP OF FOUNDATION WALL ELEVATIONS WITH DOOR OPENINGS.
3. FLOOR SLAB CONSTRUCTION JOINTS MUST BE PARALLEL TO BUILDING FRAMES. SAWCUTTING THE FLOOR SLAB COULD COMPROMISE THE STRUCTURAL INTEGRITY OF THE SLAB AND FOUNDATIONS. SAWCUTTING SHALL BE COORDINATED WITH THE STRUCTURAL ENGINEER.
4. COORDINATE EXACT LOCATION OF ALL WALLS/COLUMNS WITH ARCHITECTURAL DWGS.
5. COORDINATE EXACT SIZE AND LOCATION OF PENETRATIONS THROUGH WALLS AND SLABS WITH ARCH/MECH/ELEC/PLUMB DWGS., GENERAL CONTRACTOR AND ALL TRADES.
6. FOOTINGS SHALL BE CENTERED W/ BASE OF COLUMN.
7. RUN GRADE BEAM REINFORCING CONTINUOUS THROUGH PIER REINFORCING. PROVIDE CORNER BARS SAME SIZE AND SPACING AS LONGITUDINAL REINFORCEMENT.
8. SEE THIS SHEET FOR FOOTING AND PIER SCHEDULE.
9. COORDINATE EXACT LOCATIONS AND ELEVATIONS OF ALL WALLS W/ ARCHITECTURAL DRAWINGS.
10. GRADE BEAM CONSTRUCTION JOINTS SHALL OCCUR AT PILE CAP LOCATIONS (CENTERED OVER PILE CAPS) ONLY AND NOT BETWEEN PILES. FIELD COORDINATE LOCATIONS WITH THE ENGINEER.
11. ALL CONSTRUCTION JOINTS IN THE SLAB SHALL BE PARALLEL TO THE RIGID FRAMES.
12. SEE SHEET S-1-502 FOR SLABS LESS THAN 16-INCHES BEARING ON GRADE BEAM DETAILS.

PIER SCHEDULE

MARK	SIZE	REINF.
P1 *	2'-0" X 3'-0"	(16) - #6 VERT. & #3 TIES @ 6" O.C.

*SEE PIER DETAILS ON SHEET S-1-501. TIES SHALL BE LOCATED VERTICALLY NOT MORE THAN ONE-HALF A TIE SPACING ABOVE THE TOP OF FOOTING.

FOOTING SCHEDULE

MARK	SIZE	REINF.
F1 *	8'-4"X7'-8"X2'-0"	(9) - #6 E.W. T&B
F2 *	17'-4"X10'-4"X2'-0"	#6 @ 8" O.C. E.W. T&B

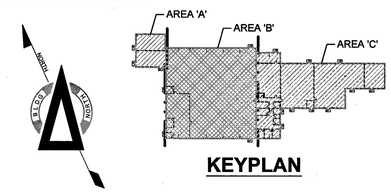
*SEE FOUNDATION DETAILS ON SHEET S-1-501.

FLOOR SLAB LEGEND

HATCH	THICKNESS	MAIN REINFORCING IN DIRECTION OF SLAB SPAN*	TRANSVERSE REINFORCING (TEMP. AND SHRINKAGE)
	8"	#5 @ 6" O.C.	#5 @ 12" O.C.
	10"	#6 @ 6" O.C.	#6 @ 12" O.C.
	12"	#7 @ 6" O.C. BOT. AND #5 @ 12" O.C. TOP	#5 @ 12" O.C. TOP AND BOT.
	14"	#7 @ 6" O.C. BOT. AND #5 @ 12" O.C. TOP	#5 @ 12" O.C. TOP AND BOT.
	16"	#7 @ 6" T&B	#7 @ 12" T&B

* SEE PLAN FOR SLAB SPAN DIRECTIONS
BOTTOM REINF. CLEARANCE 3-INCHES
TOP REINF. CLEARANCE 2-INCHES

0' 8' 16' 32' 48'
SCALE: 1" = 16'



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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CIVIL ENGINEERING / SITE DEVELOPMENT
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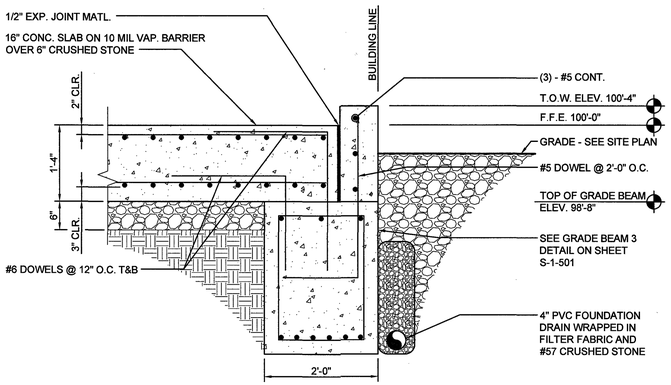
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY WAREHOUSE/GROUNDS BUILDING FOUNDATION PLAN

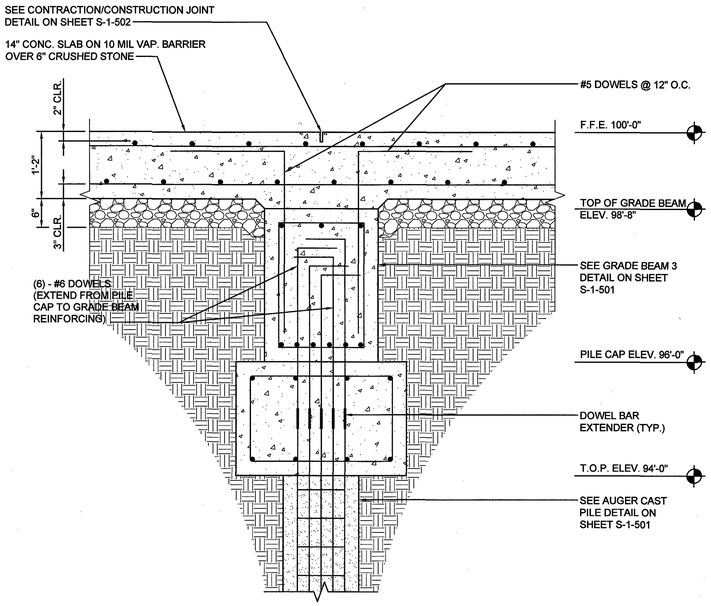
SEAL
DAVE HOY
REGISTERED
19155
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	REVISION
S-1-101	

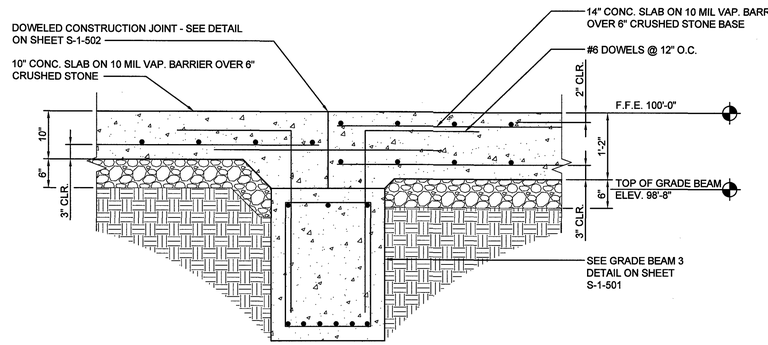


1 S-1-301 SECTION
SCALE: 3\4" = 1'-0"

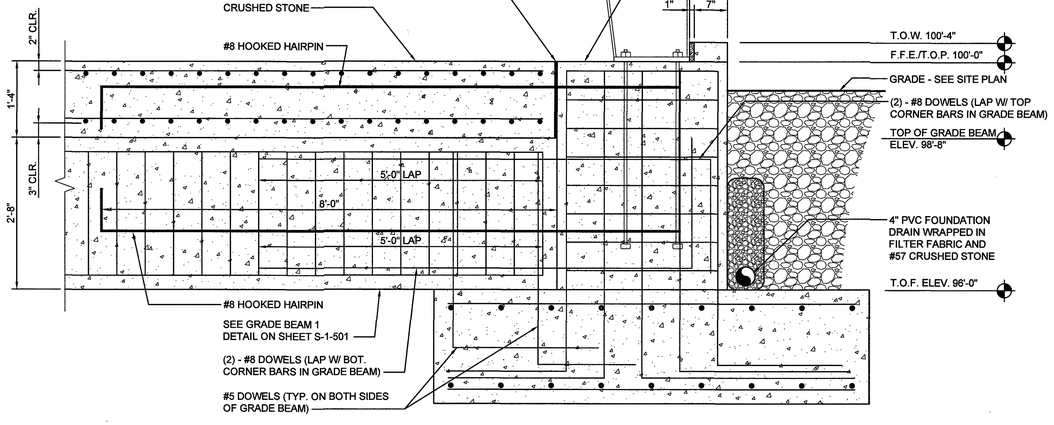
NOTE: SECTION IS SIMILAR WHERE SLAB THICKNESSES DIFFER (SLAB MUST BEAR ON TOP OF GRADE BEAMS)



2 S-1-301 SECTION
SCALE: 3\4" = 1'-0"

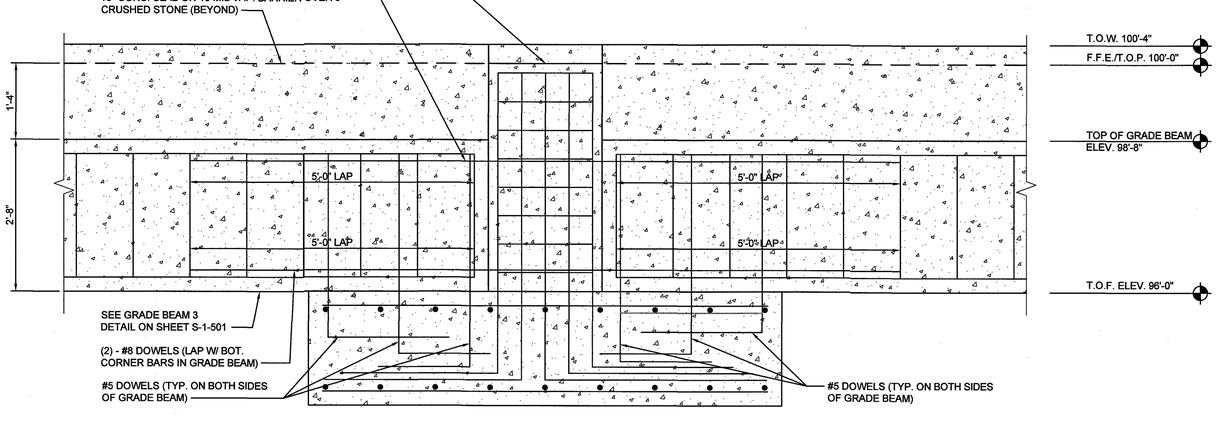


3 S-1-301 SECTION
SCALE: 3\4" = 1'-0"



4 S-1-301 SECTION
SCALE: 3\4" = 1'-0"

NOTE: TYPICAL BETWEEN GRADE BEAMS SUPPORTING FLOOR SLABS AND PIERS.



5 S-1-301 SECTION
SCALE: 3\4" = 1'-0"

NOTE: TYPICAL BETWEEN GRADE BEAMS AT EXTERIOR WALLS AND PIERS.

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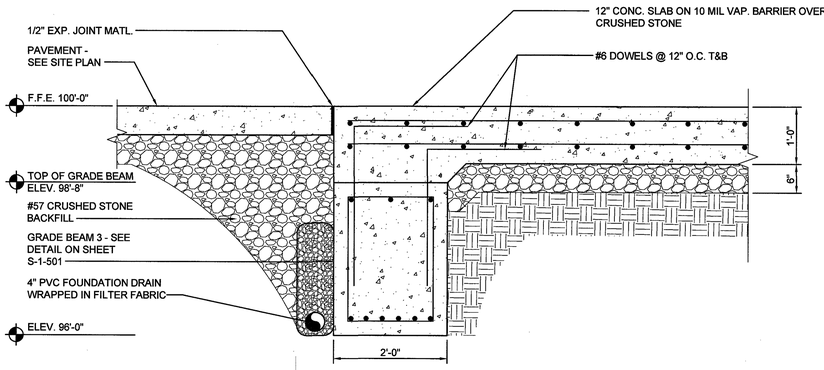
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GSD MAINTENANCE/SUPPORT FACILITY
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STRUCTURAL SECTIONS

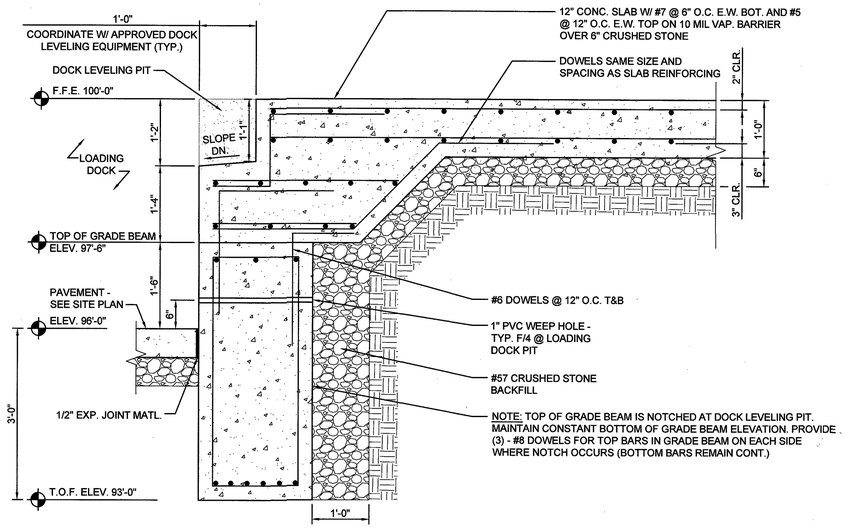
SEAL
DAVE HOY
REGISTERED
19186
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	REVISION
S-1-301	

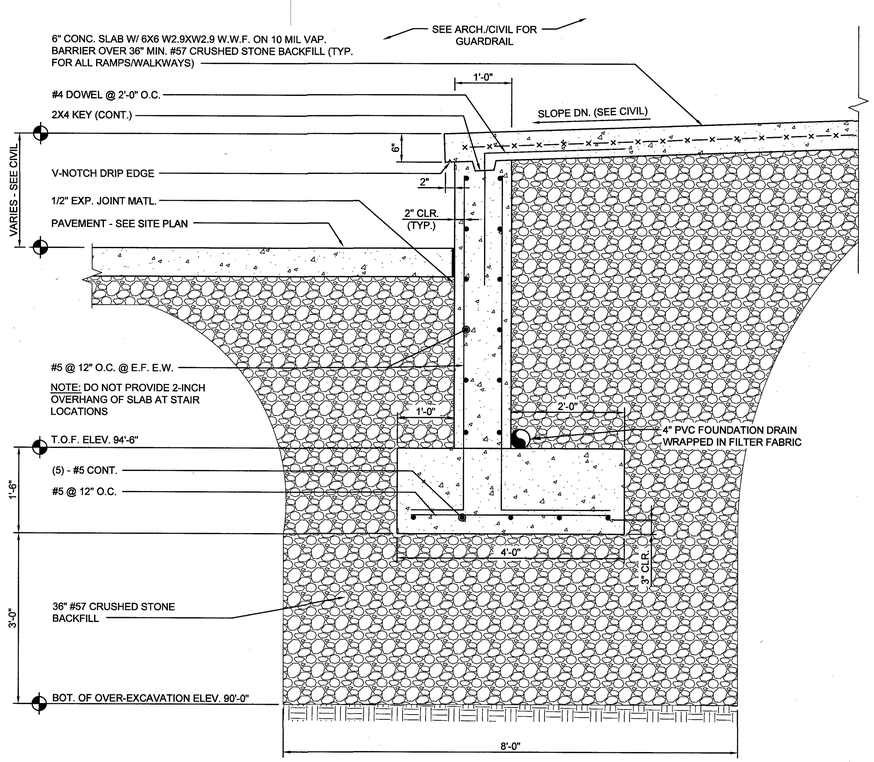


6 S-1-302 SECTION
SCALE: 3\4" = 1'-0"

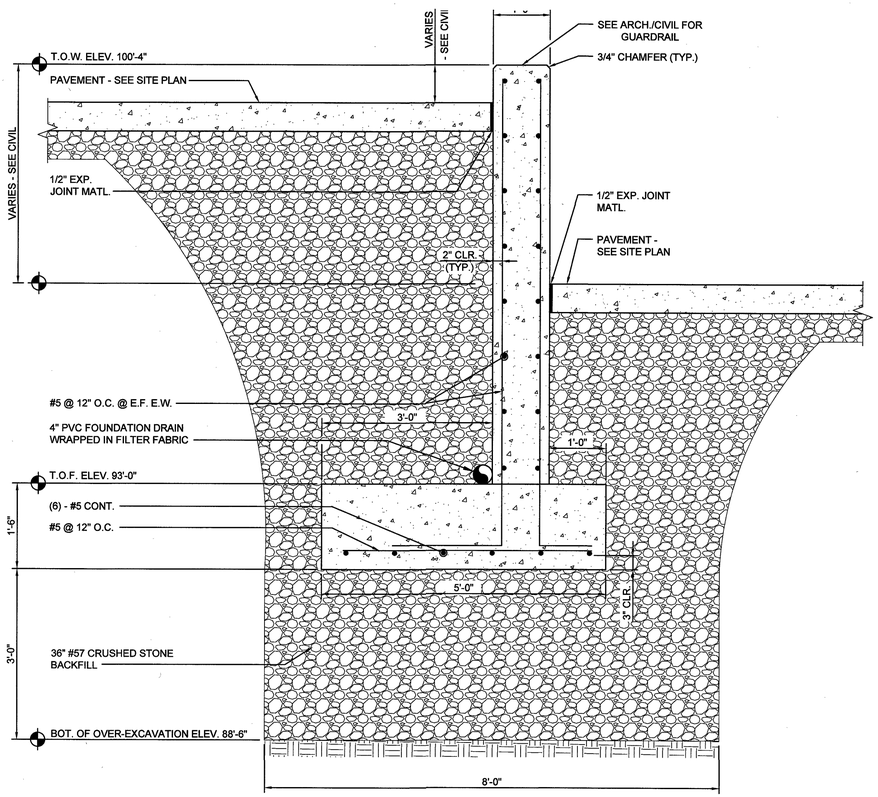
NOTE: SECTION IS TYPICAL AT ALL OPENINGS. SEE ARCHITECTURAL FOR ADDITIONAL INFORMATION.



7 S-1-302 SECTION
SCALE: 3\4" = 1'-0"



8 S-1-302 SECTION
SCALE: 3\4" = 1'-0"



9 S-1-302 SECTION
SCALE: 3\4" = 1'-0"

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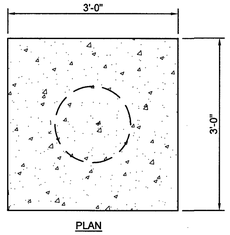
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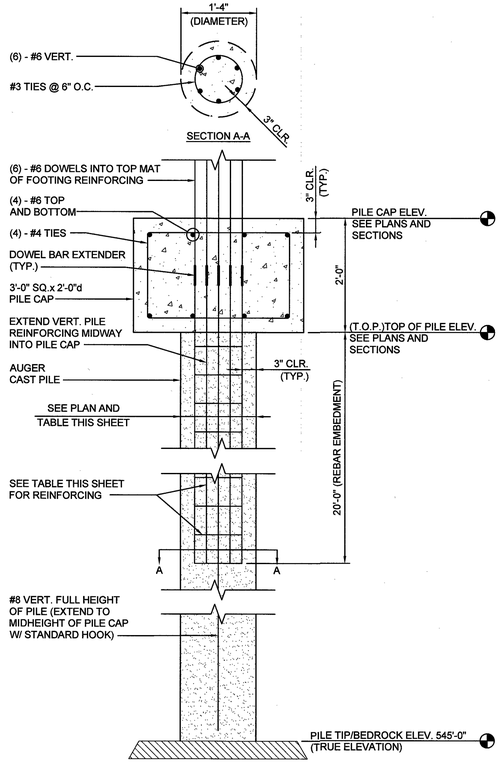
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WAREHOUSE/GROUNDS BUILDING
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SEAL
DAVE HOY
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19186
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	REVISION
S-1-302	△



PLAN



SECTION

NOTE: DETAIL IS SIMILAR FOR 18-INCH DIA. ACP

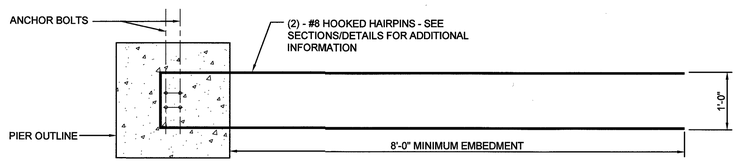
NOTES:

1. CONSTRUCT AUGER CAST PILES USING A MIN. GROUT COMPRESSIVE STRENGTH OF 4,000 PSI.
2. THE TOTAL GROUT VOLUME IN EACH PILE SHALL BE AT LEAST 120 PERCENT OF THE THEORETICAL NEAT PILE VOLUME.
3. PILES SHALL NOT BE INSTALLED WITHIN 6 PILE DIAMETERS CENTER-TO-CENTER OF A PILE FILLED WITH GROUT LESS THAN 24 HOURS OLD.
4. PROVIDE (8) - #6 DOWELS FROM PILE CAP INTO FOUNDATION SLAB.
5. REFER TO AUGER CAST PILE SPECIFICATIONS AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
6. USE STANDARD HOOK LENGTHS FOR REINFORCING.

PILE REINFORCING	
DIAMETER	REINFORCING
16-INCHES	(6)-#6 VERT. & #3 TIES @ 6" O.C.
18-INCHES	(6)-#7 VERT. & #4 TIES @ 6" O.C.

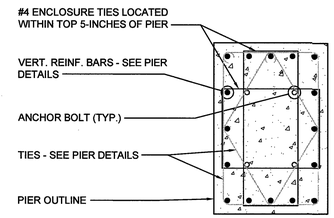
AUGER CAST PILE DETAIL

SCALE: 3/4" = 1'-0"



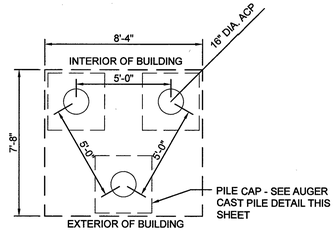
TYPICAL HAIRPIN DETAIL

NO SCALE



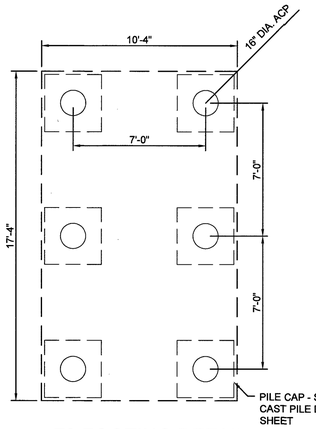
ANCHOR BOLT ENCLOSURE TIE DETAIL

SCALE: 3/4" = 1'-0"



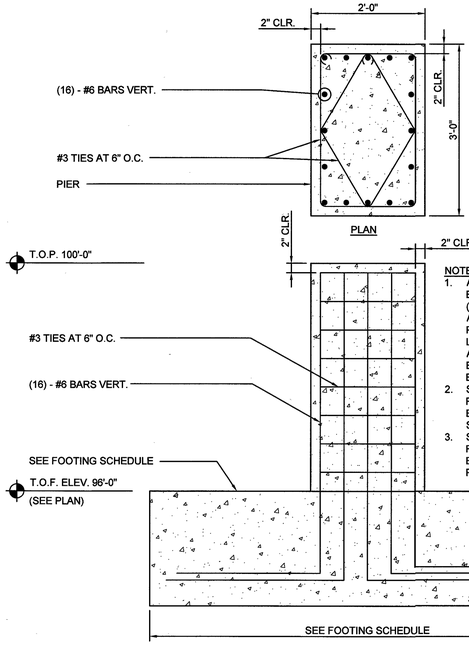
F1 FOOTING DETAIL

SCALE: 1/4" = 1'-0"



F2 FOOTING DETAIL

SCALE: 1/4" = 1'-0"

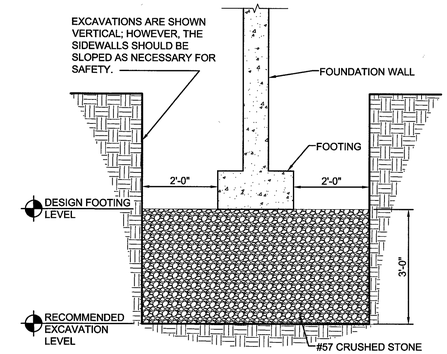


NOTES:

1. ANCHOR BOLTS SHALL BE ENCLOSED BY LATERAL REINF. (TIES) THAT ALSO SURROUNDS AT LEAST (4) VERT. BARS IN THE PIER. THIS REINF. SHALL BE LOCATED WITHIN TOP 5" OF PIER AND SHALL CONSIST OF (2) - #4 BARS - SEE ANCHOR BOLT ENCLOSURE DETAIL THIS SHEET
2. SEE SECTION 4 FOR ADDITIONAL REINFORCING BETWEEN GRADE BEAMS SUPPORTING FLOOR SLABS AND PIERS.
3. SEE SECTION 5 FOR ADDITIONAL REINFORCING BETWEEN GRADE BEAMS AT EXTERIOR WALLS AND PIERS.

PIER P1 DETAIL

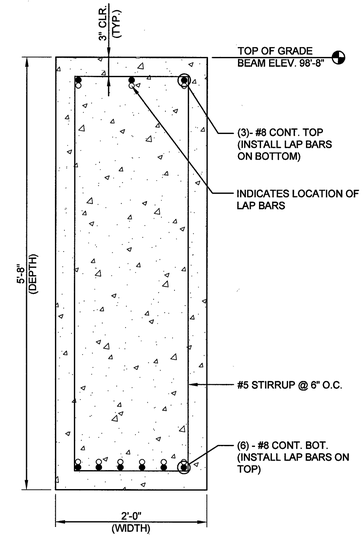
SCALE: 3/4" = 1'-0"



OVER-EXCAVATION/BACKFILL ZONE DETAIL

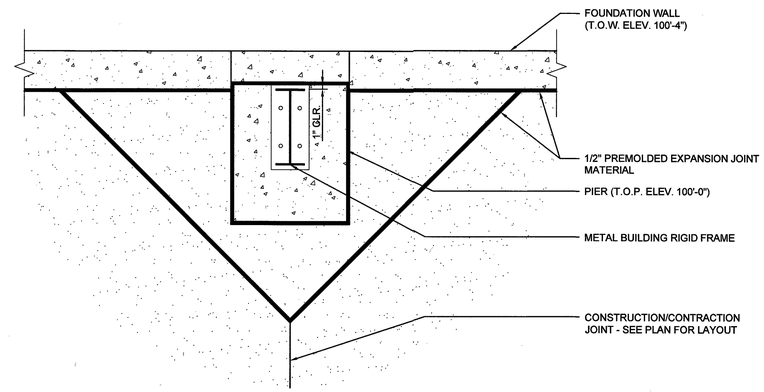
SCALE: 1/2" = 1'-0"

NOTE: DETAIL APPLIES TO EXTERIOR RETAINING WALLS AT LOADING DOCK.



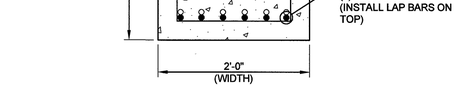
GRADE BEAM 2 (GB-2) REINFORCING DETAIL

SCALE: 1" = 1'-0"



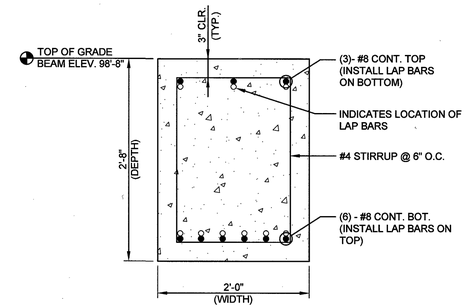
ISOLATION JOINT DETAIL

SCALE: 3/4" = 1'-0"



GRADE BEAM 3 (GB-3) REINFORCING DETAIL

SCALE: 1" = 1'-0"



GRADE BEAM 1 (GB-1) REINFORCING DETAIL

SCALE: 1" = 1'-0"

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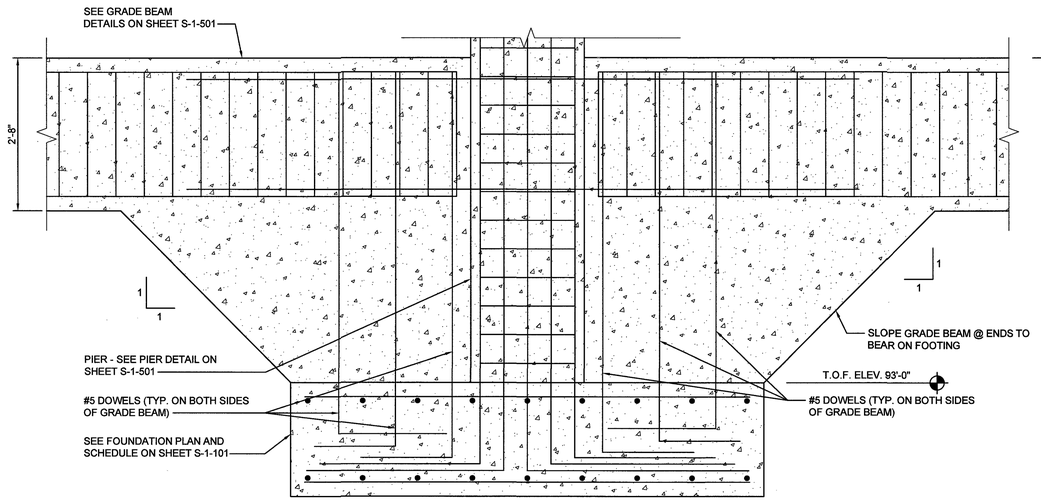
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GSD MAINTENANCE/SUPPORT FACILITY WAREHOUSE/GROUNDS BUILDING STRUCTURAL DETAILS

SEAL: DAVE HOY, REGISTERED, 19186, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER, 4/30/21

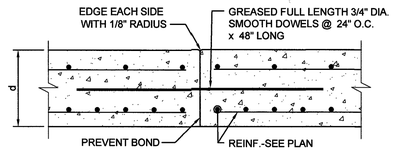
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	REVISION
S-1-501	△



GRADE BEAM BEARING ON LOWER FOUNDATION DETAIL

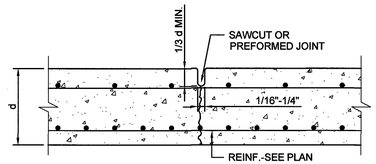
SCALE: 3/4" = 1'-0"

NOTE: DETAIL APPLIES TO ALL GRADE BEAMS THAT BEAR AT LOWER FOUNDATION ELEVATIONS. SEE SECTIONS/DETAILS FOR REINFORCING REQUIREMENTS.



DOWELED CONSTRUCTION JOINT

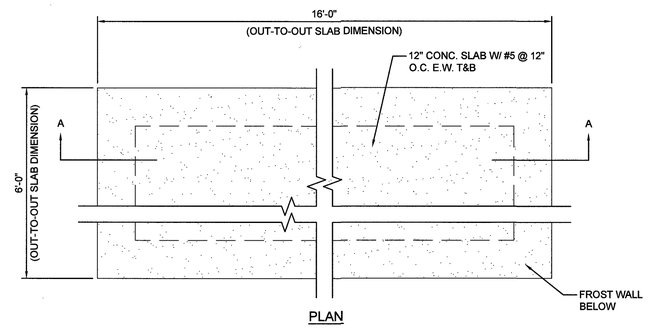
NOTE: ALL CONSTRUCTION JOINTS SHALL BE PARALLEL TO BUILDING FRAMES.



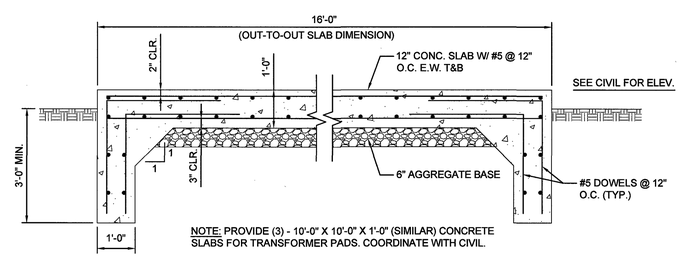
SAWED OR PREFORMED CONTRACTION JOINT

TYPICAL SLAB JOINT DETAILS

NO SCALE



PLAN

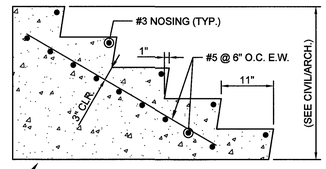


NOTE: PROVIDE (3) - 10'-0" X 10'-0" X 1'-0" (SIMILAR) CONCRETE SLABS FOR TRANSFORMER PADS. COORDINATE WITH CIVIL.

SECTION A-A

GENERATOR PAD DETAIL

SCALE: 1/2" = 1'-0"

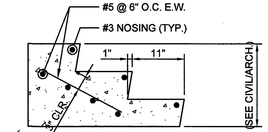


SEE OVER-EXCAVATION/BACKFILL ZONE DETAIL ON SHEET S-1-501 FOR SUBGRADE PREP BENEATH STAIRS

STAIR DETAIL 1

SCALE: 3/4" = 1'-0"

NOTE:
1. PROVIDE BOND BREAKER BTWN. STAIRS AND RETAINING WALL.

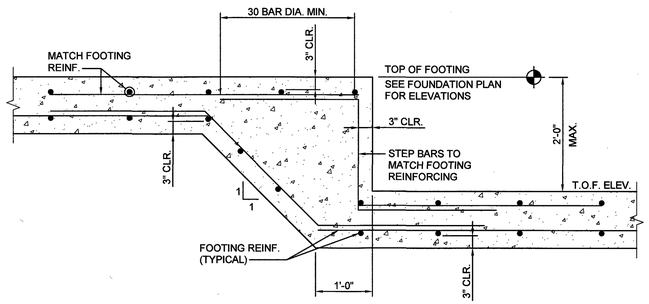


SEE OVER-EXCAVATION/BACKFILL ZONE DETAIL ON SHEET S-1-501 FOR SUBGRADE PREP BENEATH STAIRS

STAIR DETAIL 2

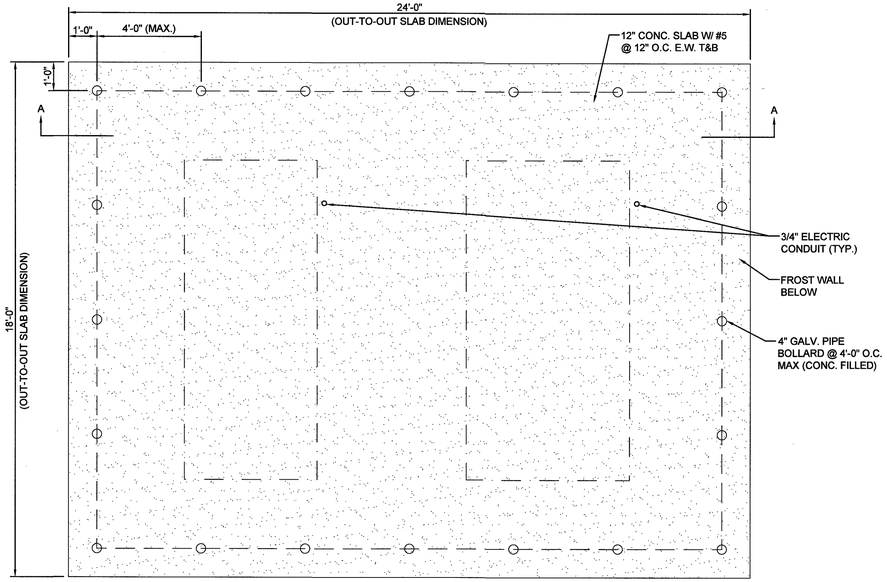
SCALE: 3/4" = 1'-0"

NOTE:
1. PROVIDE BOND BREAKER BTWN. STAIRS AND RETAINING WALL.

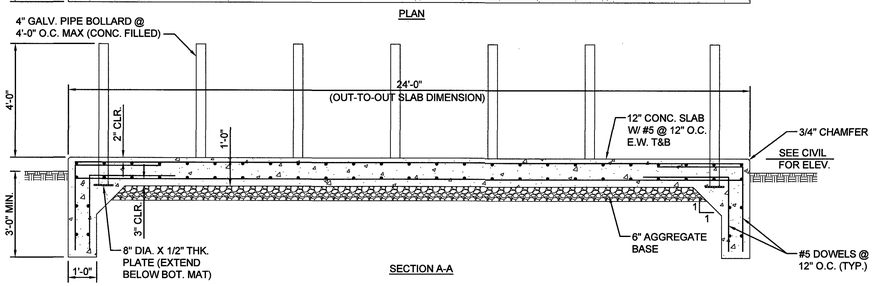


TYPICAL STEPPED FOOTING DETAIL

SCALE: NONE



PLAN



SECTION A-A

FUEL PAD DETAIL

SCALE: 3/8" = 1'-0"

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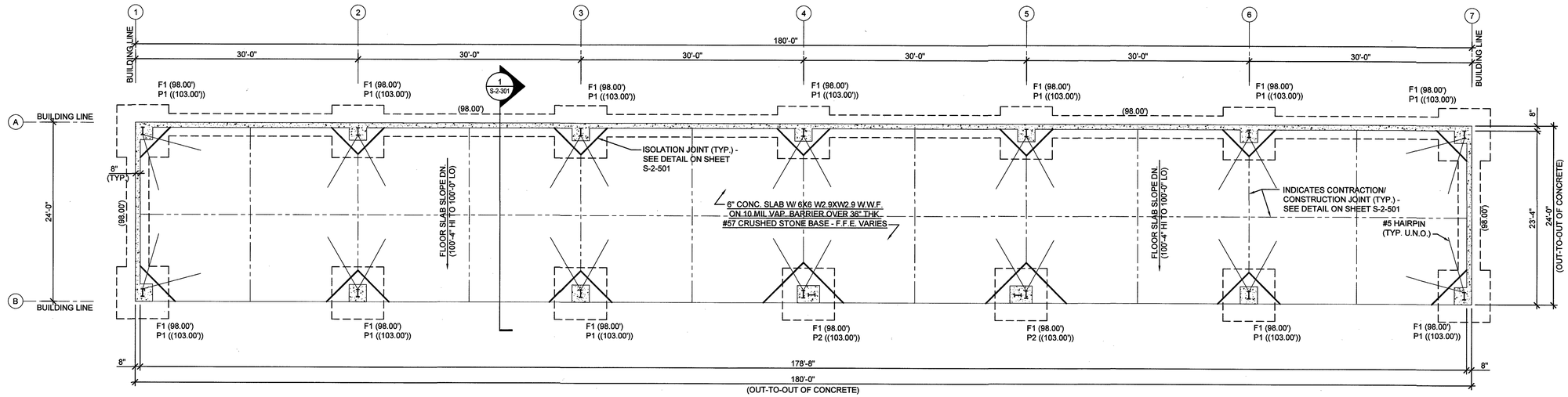
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Charleston, West Virginia

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SHEET NO.	REVISION
S-1-502	△



OPEN STORAGE FOUNDATION PLAN

SCALE: 1/8" = 1'-0"

PIER SCHEDULE		
MARK	SIZE	REINF.
P1 *	2'-4" X 2'-4"	(16) - #6 VERT. & #3 TIES @ 6" O.C.
P2 *	3'-0" X 2'-4"	(16) - #6 VERT. & #3 TIES @ 6" O.C.

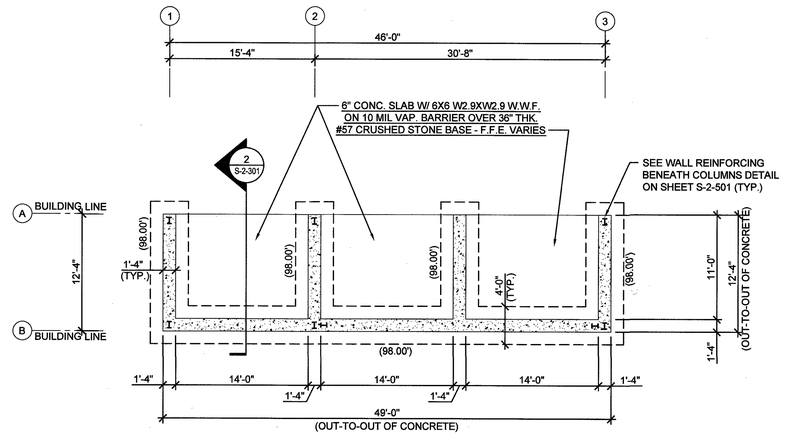
*SEE PIER DETAILS ON SHEET S-2-501. TIES SHALL BE LOCATED VERTICALLY NOT MORE THAN ONE-HALF A TIE SPACING ABOVE THE TOP OF FOOTING.

FOOTING SCHEDULE		
MARK	SIZE	REINF.
F1	7'-0"X7'-0"X1'-4"	(9) - #6 E.W. *

*REINFORCING SHALL BE PLACED 3-INCHES CLR. FROM BOTTOM OF FOOTING

NOTES:

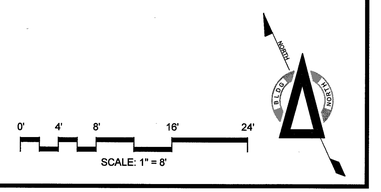
1. TYPICAL COLUMN PIERS, FOUNDATION SIZES, AND DETAILS THAT PERTAIN TO THE METAL BUILDING(S) ARE FOR CONTRACTOR ESTIMATING PURPOSES ONLY AND HAVE BEEN DESIGNED BASED ON PRELIMINARY LOADING INFORMATION. CONTRACTOR SHALL SUBMIT FINAL METAL BUILDING REACTIONS TO STRUCTURAL ENGINEER FOR FINAL FOUNDATION DESIGN AND ANCHOR BOLT EMBEDMENT. CONTRACTOR SHALL ASSUME 12" ANCHOR BOLT EMBEDMENT FOR OPEN STORAGE METAL BUILDING STRUCTURE AND 12" ANCHOR BOLT EMBEDMENT FOR OPEN BULK STORAGE METAL BUILDING STRUCTURE.
2. TOP OF FOOTING ELEVATION INDICATED THUS (') ON PLAN. TOP OF FOOTING ELEVATION 98.00' U.N.O. TOP OF PIER ELEVATION INDICATED THUS ((')) ON PLAN. TOP OF PIER ELEVATION 103.00' U.N.O.
3. COORDINATE EXACT LOCATION OF ALL WALLS/COLUMNS WITH ARCHITECTURAL DWGS.
4. COORDINATE EXACT SIZE AND LOCATION OF PENETRATIONS THROUGH WALLS AND SLABS WITH ARCH/MECH/ELEC/PLUMB DWGS., GENERAL CONTRACTOR AND ALL TRADES.
5. FOOTINGS SHALL BE CENTERED W/ BASE OF COLUMN.
6. RUN WALL FOOTING REINFORCING CONTINUOUS THROUGH COLUMN FOOTING REINFORCING. RUN FOUNDATION WALL REINFORCING CONTINUOUS THROUGH PIER REINFORCING. PROVIDE CORNER BARS IN FOOTINGS AND FOUNDATION WALLS SAME SIZE AND SPACING AS LONGITUDINAL REINFORCEMENT.
7. SEE THIS SHEET FOR FOOTING AND PIER SCHEDULE.
8. THE CONTRACTOR SHALL ENGAGE A QUALIFIED GEOTECHNICAL REPRESENTATIVE TO VERIFY THAT SUITABLE SUBGRADE CONDITIONS (THAT MEET OR EXCEED THE REQUIREMENTS SET FORTH IN CONTRACT DOCUMENTS AND THE GEOTECHNICAL REPORT) ARE MET PRIOR TO THE PLACEMENT OF BACKFILL, FOUNDATIONS, AND FLOOR SLABS. SEE OVER-EXCAVATION/BACKFILL ZONE DETAIL FOR REQUIREMENTS BENEATH FOUNDATIONS. SEE GEOTECH REPORT FOR PROOFROLLING REQUIREMENTS OF THE EXPOSED SUBGRADE PRIOR TO PLACING BACKFILL.
9. BUILDING UTILITIES SHALL PASS THRU THE FOUNDATION WALLS AND NOT BENEATH OR THRU THE FOOTINGS. COORDINATE ALL PENETRATIONS WITH PLUMBING, ELECTRIC, AND MECHANICAL DRAWINGS AND REFERENCE STEPPED FOOTING DETAIL ON SHEET S-2-501 (FIELD COORDINATE).
10. SEE SHEET S-2-501 FOR HAIRPIN DETAIL.
11. ALL CONSTRUCTION JOINTS IN THE SLAB SHALL BE PARALLEL TO THE RIGID FRAMES.



OPEN BULK STORAGE FOUNDATION PLAN

SCALE: 1/8" = 1'-0"

NOTE: SEE SECTION FOR FLOOR SLAB SLOPE.



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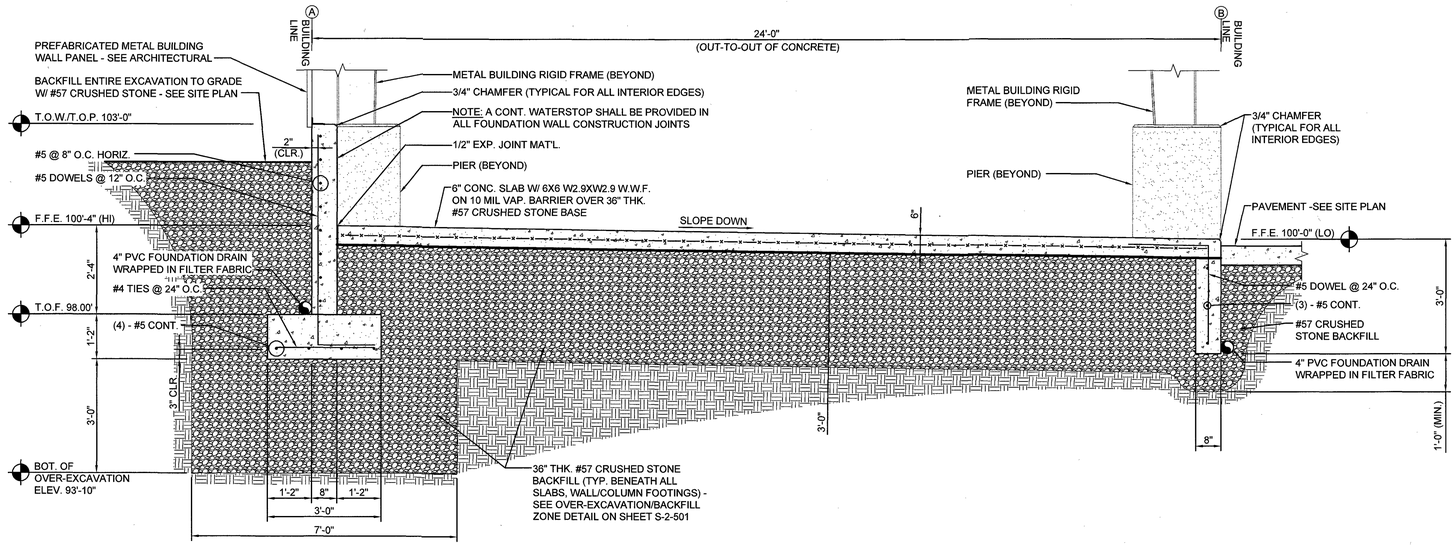
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General Services Division
Capitol East Campus
Charleston, West Virginia

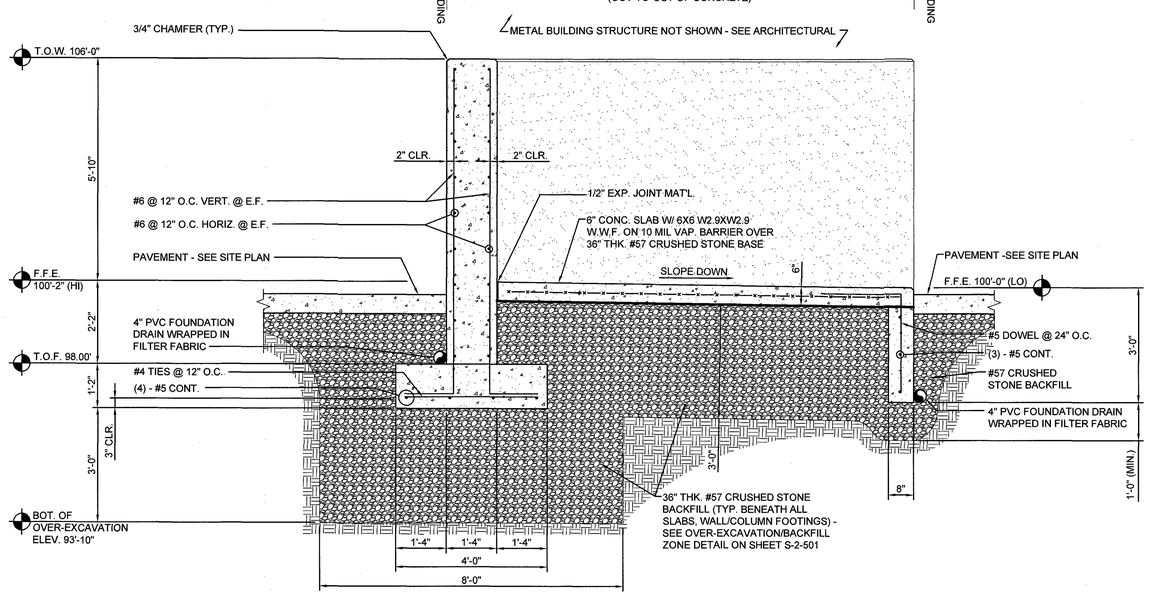
OPEN STORAGE AND BULK STORAGE FOUNDATION PLANS

SEAL
DAVE HOP
REGISTERED
19186
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	REVISION
S-2-100	



1 S-2-301 **SECTION**
SCALE: 1\2" = 1'-0"



2 S-2-301 **SECTION**
SCALE: 1\2" = 1'-0"

NOTE: PROVIDE EPOXY COATED REBAR/W.W.F. FOR WALLS/SLABS USED FOR SALT STORAGE. COORDINATE LOCATION W/ OWNER.

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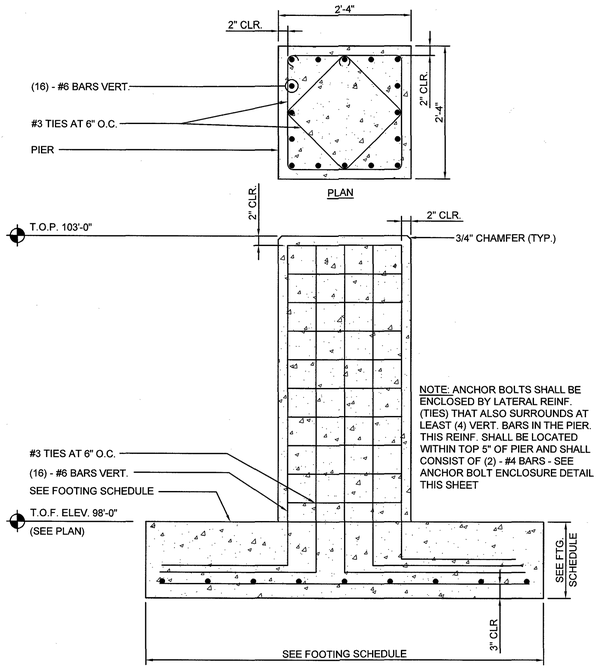
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

OPEN STORAGE AND BULK STORAGE STRUCTURAL SECTIONS

SEAL
DAVE HOY
REGISTERED
19186
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
4/30/21

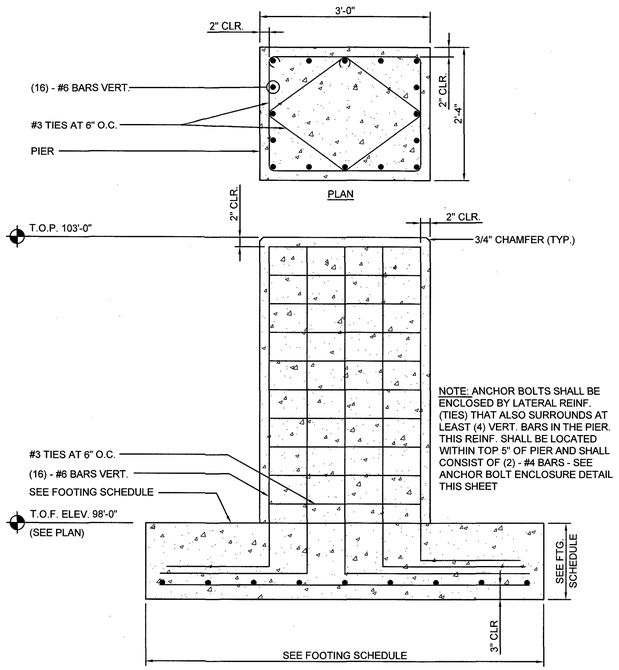
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	S-2-301
REVISION	△

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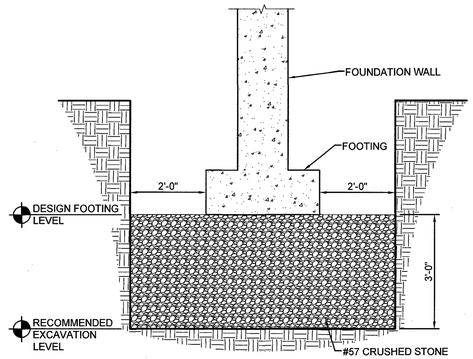
PIER P1 DETAIL

SCALE: 3/4" = 1'-0"



PIER P2 DETAIL

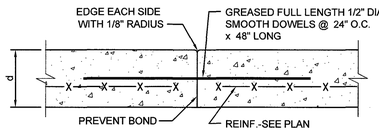
SCALE: 3/4" = 1'-0"



OVER-EXCAVATION/BACKFILL ZONE DETAIL

SCALE: 1/2" = 1'-0"

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY.



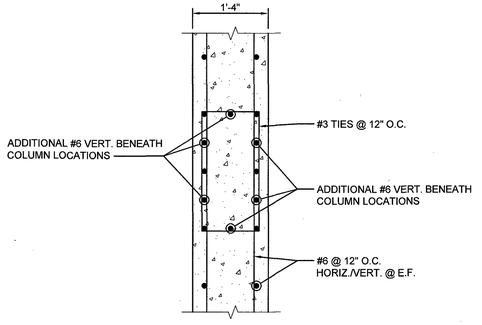
DOWELED CONSTRUCTION JOINT

NOTE: ALL CONSTRUCTION JOINTS SHALL BE PARALLEL TO BUILDING FRAMES.

SAWED OR PREFORMED CONTRACTION JOINT

TYPICAL SLAB JOINT DETAILS

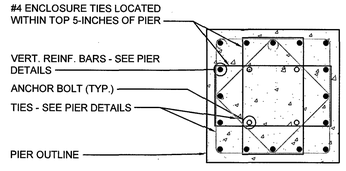
NO SCALE



WALL REINFORCING BENEATH COLUMNS DETAIL

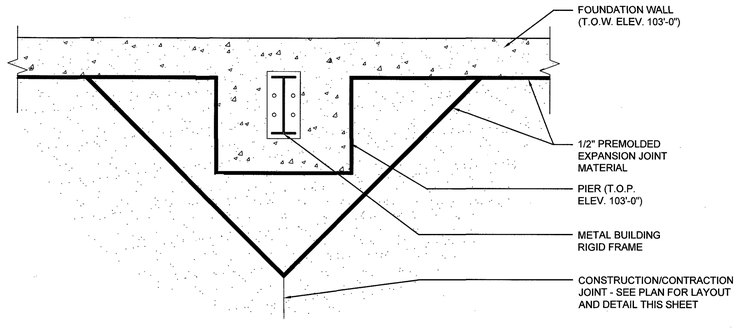
SCALE: 3/4" = 1'-0"

NOTE: DETAIL APPLIES TO OPEN BULK STORAGE STRUCTURE ONLY. SEE ANCHOR BOLT ENCLOSURE TIE DETAIL FOR ADDITIONAL INFORMATION.



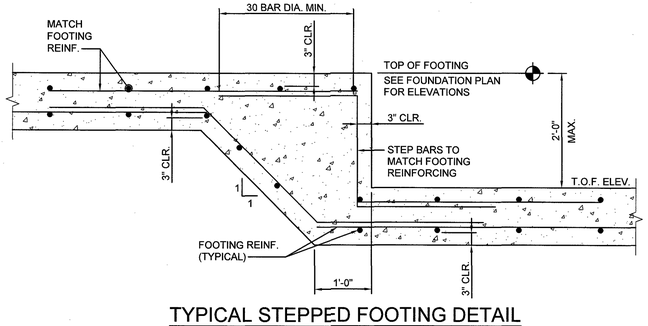
ANCHOR BOLT ENCLOSURE TIE DETAIL

SCALE: 3/4" = 1'-0"



ISOLATION JOINT DETAIL

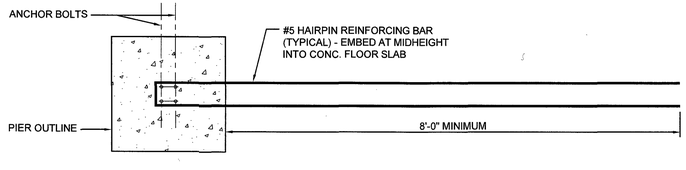
SCALE: 3/4" = 1'-0"



TYPICAL STEPPED FOOTING DETAIL

SCALE: NONE

NOTE: FIELD COORDINATE FOOTING STEPS W/ ALL UTILITY ENTRANCES/EXITS SHOWN ON MECHANICAL/PLUMBING DRAWINGS.



TYPICAL HAIRPIN DETAIL

NO SCALE

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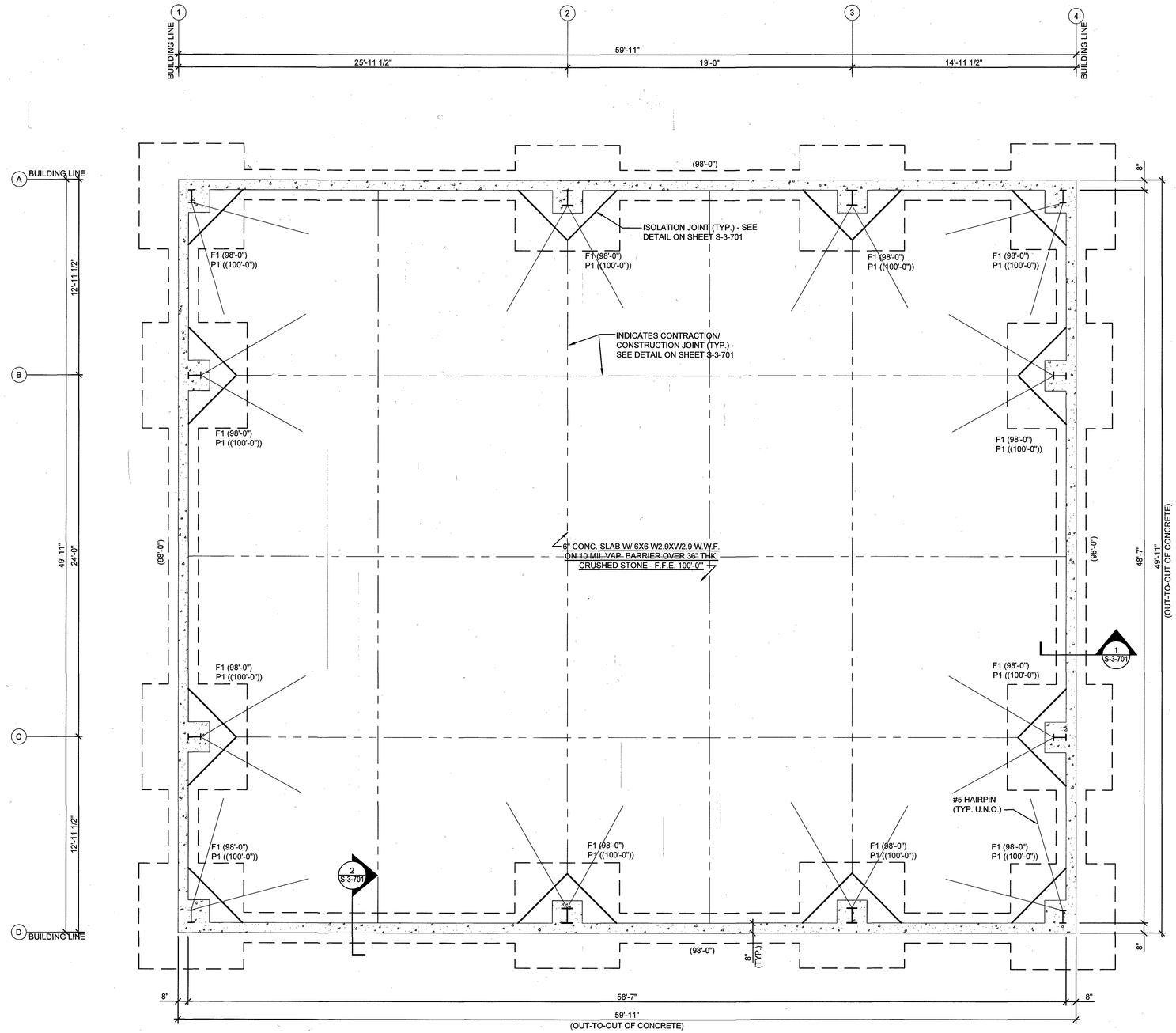
PROJECT INFORMATION
West Virginia Department of Administration
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OPEN STORAGE AND BULK STORAGE STRUCTURAL DETAILS

SEAL: DAVE HOY, REGISTERED, 19186, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER — 4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	DECEMBER 2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	S-2-501
REVISION	△

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MAIL ROOM FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

PIER SCHEDULE		
MARK	SIZE	REINF.
P1*	2'-0" X 2'-0"	(16) - #6 VERT. & #3 TIES @ 6" O.C.

*SEE PIER DETAIL ON SHEET S-3-701. TIES SHALL BE LOCATED VERTICALLY NOT MORE THAN ONE-HALF A TIE SPACING ABOVE THE TOP OF FOOTING.

FOOTING SCHEDULE		
MARK	SIZE	REINF.
F1	7'-0"X7'-0"X1'-4"	(9) - #6 E.W.

NOTES:

1. TYPICAL COLUMN PIERS, FOUNDATION SIZES, AND DETAILS THAT PERTAIN TO THE METAL BUILDING ARE FOR CONTRACTOR ESTIMATING PURPOSES ONLY AND HAVE BEEN DESIGNED BASED ON PRELIMINARY LOADING INFORMATION. CONTRACTOR SHALL SUBMIT FINAL METAL BUILDING REACTIONS TO STRUCTURAL ENGINEER FOR FINAL FOUNDATION DESIGN AND ANCHOR BOLT EMBEDMENT. CONTRACTOR SHALL ASSUME 12" ANCHOR BOLT EMBEDMENT.
2. TOP OF FOOTING ELEVATION INDICATED THUS (') ON PLAN. TOP OF FOOTING ELEVATION 98'-0" U.N.O. TOP OF PIER ELEVATION INDICATED THUS ((')) ON PLAN. TOP OF PIER ELEVATION 100'-0" U.N.O. F.F.E. 100'-0".
3. COORDINATE EXACT LOCATION OF ALL WALLS/COLUMNS WITH ARCHITECTURAL DWGS.
4. COORDINATE EXACT SIZE AND LOCATION OF PENETRATIONS THROUGH WALLS AND SLABS WITH ARCH/MECH/ELEC/PLUMB DWGS., GENERAL CONTRACTOR AND ALL TRADES.
5. FOOTINGS SHALL BE CENTERED W/ BASE OF COLUMN.
6. RUN WALL FOOTING REINFORCING CONTINUOUS THROUGH COLUMN FOOTING REINFORCING. RUN FOUNDATION WALL REINFORCING CONTINUOUS THROUGH PIER REINFORCING. PROVIDE CORNER BARS IN FOOTINGS AND FOUNDATION WALLS SAME SIZE AND SPACING AS LONGITUDINAL REINFORCEMENT.
7. SEE THIS SHEET FOR FOOTING AND PIER SCHEDULE.
8. THE CONTRACTOR SHALL ENGAGE A QUALIFIED GEOTECHNICAL REPRESENTATIVE TO VERIFY THAT SUITABLE SUBGRADE CONDITIONS (THAT MEET OR EXCEED THE REQUIREMENTS SET FORTH IN CONTRACT DOCUMENTS AND THE GEOTECHNICAL REPORT) ARE MET PRIOR TO THE PLACEMENT OF BACKFILL, FOUNDATIONS. AND FLOOR SLABS. SEE OVER-EXCAVATION BACKFILL ZONE DETAIL FOR REQUIREMENTS BENEATH FOUNDATIONS. SEE GEOTECH REPORT FOR PROOFROLLING REQUIREMENTS OF THE EXPOSED SUBGRADE PRIOR TO PLACING BACKFILL.
9. BUILDING UTILITIES SHALL PASS THRU THE FOUNDATION WALLS AND NOT BENEATH OR THRU THE FOOTINGS. COORDINATE ALL PENETRATIONS WITH PLUMBING, ELECTRIC, AND MECHANICAL DRAWINGS AND REFERENCE STEPPED FOOTING DETAIL ON SHEET S-3-701 (FIELD COORDINATE).

0' 2' 4' 8' 12'

SCALE: 1/4" = 1'-0"

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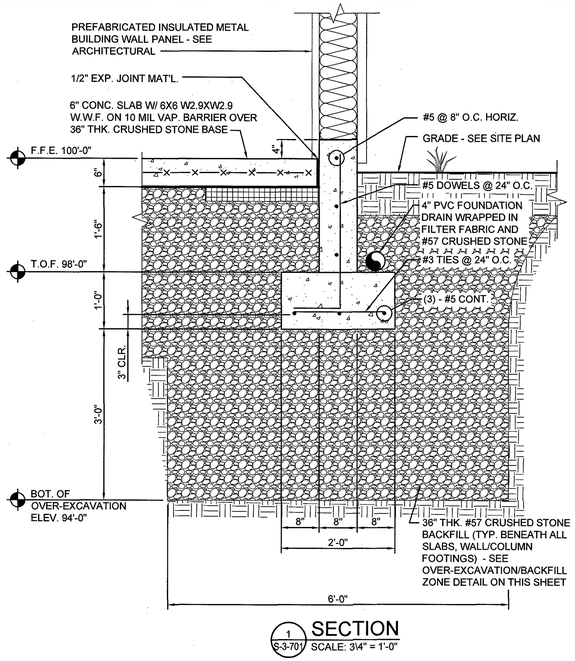
PROJECT INFORMATION
West Virginia Department of Administration
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CAPITOL MAILROOM FOUNDATION PLAN ALTERNATE 1

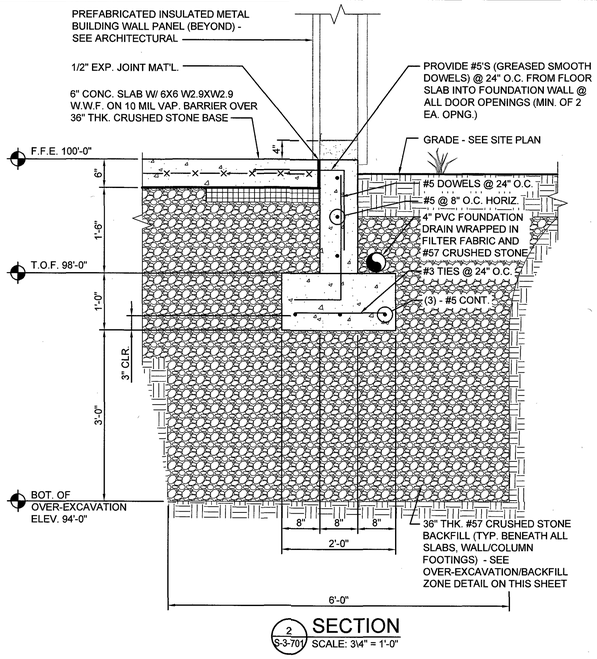
SEAL: DAVE HOY, REGISTERED, 19185, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER, 4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	09/30/2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	REVISION
S-3-100	△

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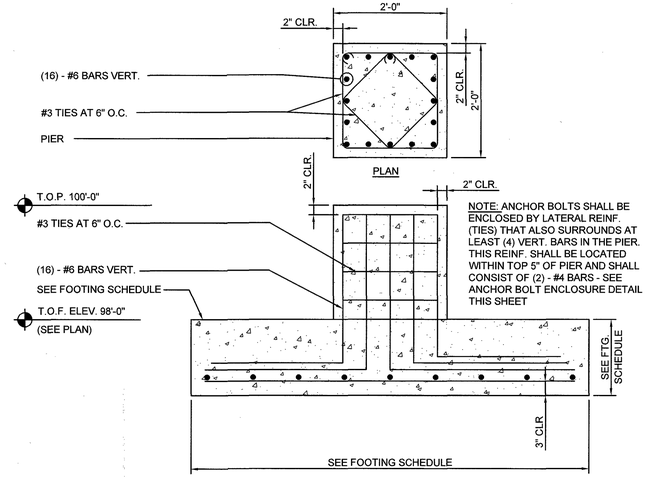


1 S-3-701 SECTION
SCALE: 3/4" = 1'-0"

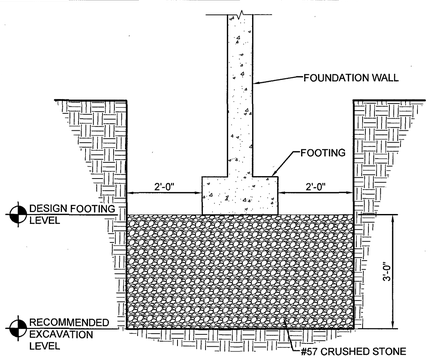


2 S-3-701 SECTION
SCALE: 3/4" = 1'-0"

NOTE: SECTION IS TYP. AT ALL OPENINGS.

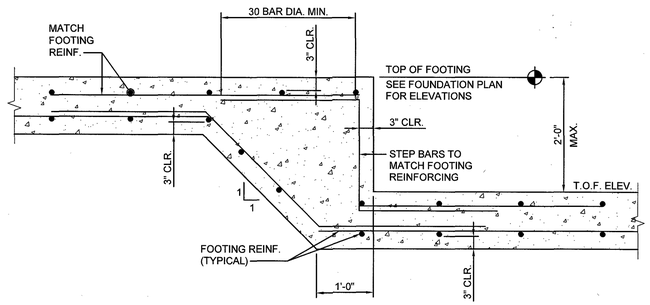


PIER P1 DETAIL
SCALE: 3/4" = 1'-0"



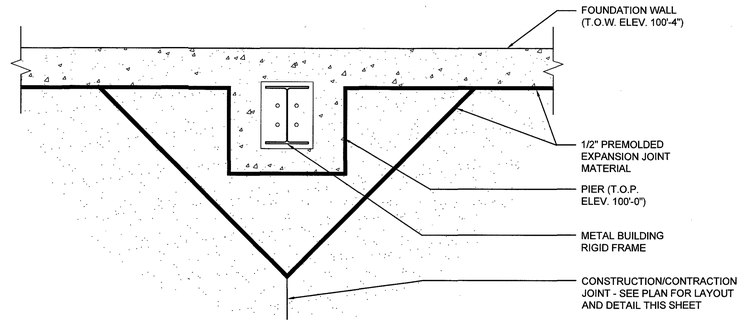
OVER-EXCAVATION/BACKFILL ZONE DETAIL
SCALE: 1/2" = 1'-0"

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY.

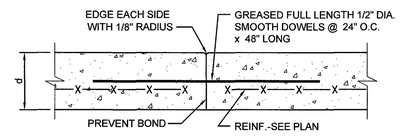


TYPICAL STEPPED FOOTING DETAIL
SCALE: NONE

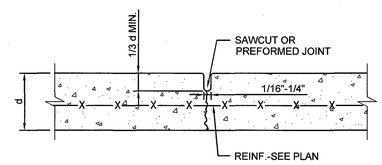
NOTE: FIELD COORDINATE FOOTING STEPS W/ ALL UTILITY ENTRANCES/EXITS SHOWN ON MECHANICAL/PLUMBING DRAWINGS.



ISOLATION JOINT DETAIL
SCALE: 3/4" = 1'-0"

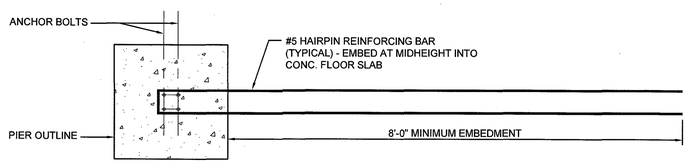


DOWELED CONSTRUCTION JOINT

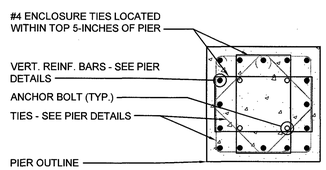


SAWED OR PREFORMED CONTRACTION JOINT

TYPICAL SLAB JOINT DETAILS
NO SCALE



TYPICAL HAIRPIN DETAIL
NO SCALE



ANCHOR BOLT ENCLOSURE TIE DETAIL
SCALE: 3/4" = 1'-0"

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAILROOM
STRUCTURAL SECTIONS AND DETAILS
ALTERNATE 1

DAVE HOY REGISTERED 19186 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
4/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	09/30/2020
DRAWN BY:	KJW
DESIGNED BY:	DCH
CHECKED BY:	DCH
SHEET NO.	S-3-701
REVISION	△

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BUILDING SYSTEM EFFICIENCY REQUIREMENTS

BUILDING 1 - WAREHOUSE/GROUNDS BUILDING

PROVIDE THERMAL EFFICIENCY OF BUILDING SYSTEM PER ANSI/ASHRAE 90.1-2010, CLIMATE ZONE 4A INCLUDING THE FOLLOWING:

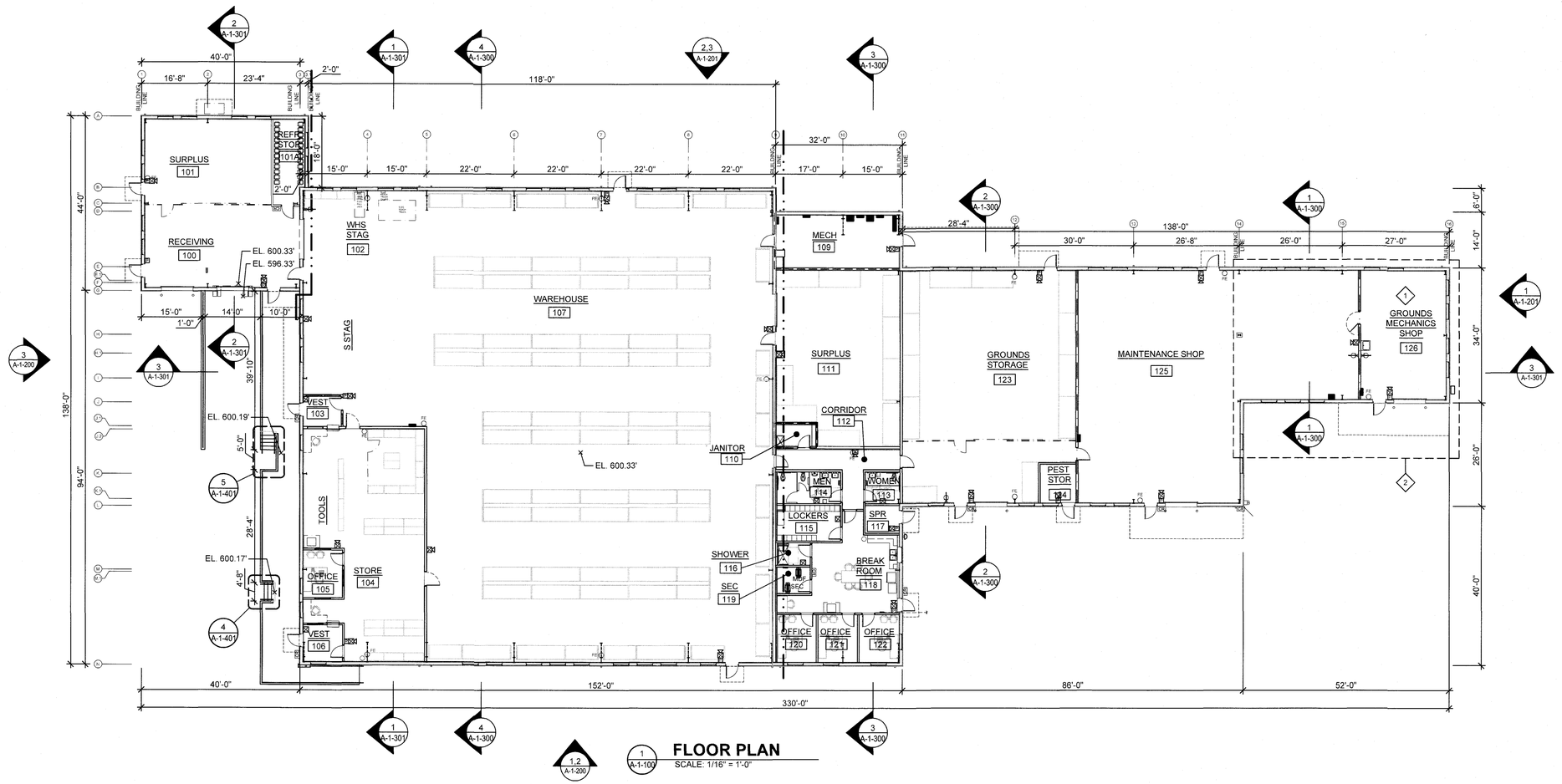
WALL INSULATION-	ASSEMBLY MAX U-0.084 OR R-19 INSULATION
ROOF INSULATION-	ASSEMBLY MAX U-0.055 OR R-13 + R-13 INSULATION W/THERMAL SPACER BLOCKING
WINDOWS-	ASSEMBLY MAX U-0.35, MAX. SHGC 0.40
DOORS-	ASSEMBLY MAX U-0.80, MAX. SHGC 0.40
OVERHEAD DOORS-	ASSEMBLY MAX U-0.50, MAX. SHGC 0.40

ASSEMBLY MAX METHOD OF WALL CONSTRUCTION MUST FOLLOW ANSI/ASHRAE 90.1-2010, TABLE A3.2 ASSEMBLY U-FACTORS FOR METAL BUILDING WALLS.

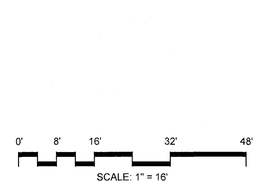
ASSEMBLY MAX METHOD OF ROOF CONSTRUCTION MUST FOLLOW ANSI/ASHRAE 90.1-2010, TABLE A2.3 ASSEMBLY U-FACTORS FOR METAL BUILDING ROOFS.

CONSTRUCTION NOTES

1. OCCUPANCY OF THE NEW GROUNDS MECHANICS SHOP IS THE FIRST PRIORITY. THE EXISTING "MAIN SHOP" MUST BE OCCUPIED AND USABLE BY THE OWNER UNTIL THE GROUNDS MECHANICS SHOP IS ABLE TO BE OCCUPIED AND USED BY THE OWNER. SEE PHASING PLAN FOR ADDITIONAL PHASING REQUIREMENTS.
2. PHASE 1 - CONTRACTOR MUST GET GROUNDS MECHANICS SHOP OPERATIONAL AND OCCUPIED PRIOR TO DEMOLITION OF EXISTING MECHANIC'S SHOP. THE CONTRACTOR MUST BUILD AS MUCH OF THE MAINTENANCE SHOP AS REQUIRED TO PROVIDE THAT CONSTRUCTION, AND MUST PROVIDE THE ONE HOUR WALL AND DOOR AS PROTECTION OF THE OCCUPIED SPACE DURING THE CONSTRUCTION OF THE REST OF THE FACILITY. SEE ADDITIONAL NOTES ON PHASING PLAN G-003.



1,2 A-1-200 | 1 A-1-100 **FLOOR PLAN** SCALE: 1/16" = 1'-0"



KEYPLAN

0' 8' 16' 32' 48'
SCALE: 1" = 16'

REVISION NUMBER	REVISIONS	DATE	BY

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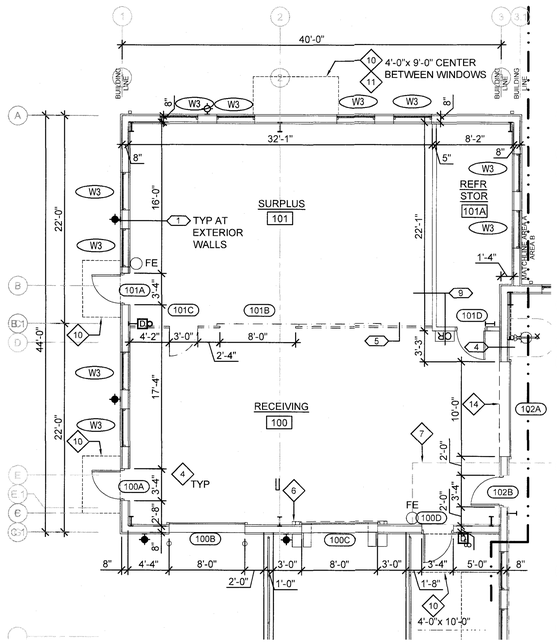
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
FLOOR PLAN

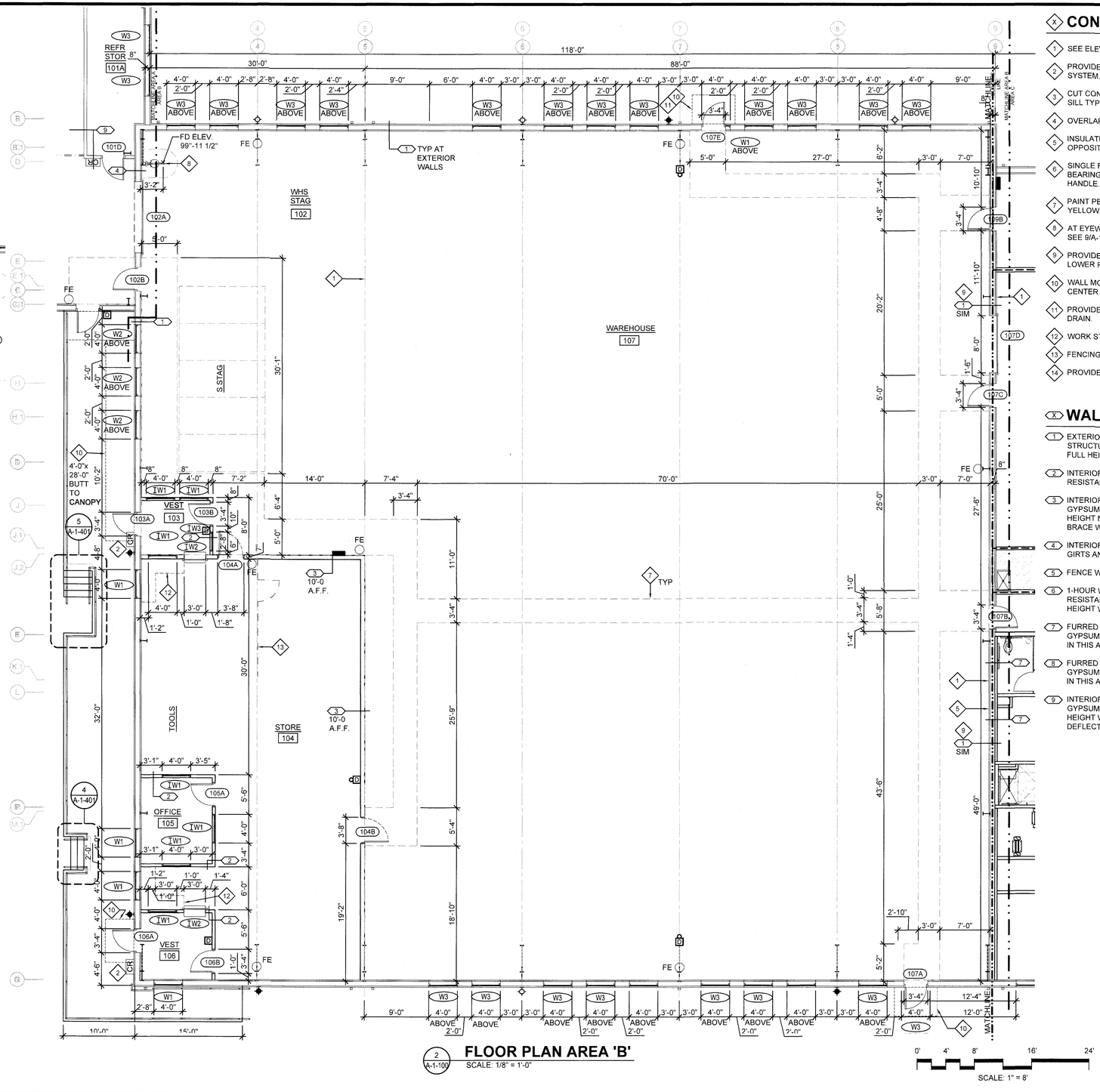
SEAL: STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	A-1-100
REVISION	△

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1 A-1-100 **FLOOR PLAN AREA 'A'**
SCALE: 1/8" = 1'-0"



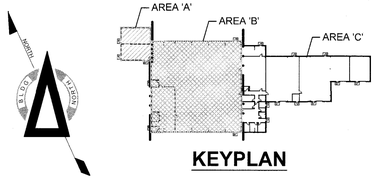
2 A-1-100 **FLOOR PLAN AREA 'B'**
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

1. SEE ELEVATIONS FOR LOCATIONS OF WINDOWS ABOVE.
2. PROVIDE CARD READER SYSTEM LINKED TO WV PROTECTIVE SERVICES CARD ACCESS SYSTEM.
3. CUT CONCRETE CURB AT PERSONNEL AND OVERHEAD DOORS TO PROVIDE DRAINING SILL TYPICAL, SEE 2/A-1-500.
4. OVERLAP METAL BUILDING SYSTEM OVER CURB 1" MIN., TYPICAL, SEE 1/A-1-500.
5. INSULATE ENTIRE WALL AND PROVIDE LINER PANELS ABOVE AND BELOW ROOF ON OPPOSITE SIDE OF WALL.
6. SINGLE FIXED SCISSOR GATE 10'-0"W X 6'-0"H EXTENDED HEIGHT WITH LOCKING BAR, BEARING WASHER, 9" OFFSET INSTALLATION BRACKETS, SCHOOL STRAP, AND GATE HANDLE.
7. PAINT PEDESTRIAN ACCESS AISLES ON FLOOR, 3" WIDE SOLID STRIPES, COLOR SAFETY YELLOW.
8. AT EYEWASH STATIONS SLOPE FLOOR TO FLOOR DRAIN WITH DRAIN 1/2" BELOW F.F.E. SEE 9/A-1-500 FOR TYPICAL DETAIL.
9. PROVIDE INSULATION AND PROVIDE LINER PANELS ON BOTH SIDES OF GIRTS BELOW LOWER ROOF AREA.
10. WALL MOUNTED HANGING CANOPY SYSTEM W/INTEGRAL DRAINS AT 8'-6" TO B/O CANOPY. CENTER OVER DOOR, TYPICAL. 4'-0"x 6'-0" U.N.O., TYPICAL.
11. PROVIDE CONCRETE PAD MATCHING CANOPY DIMENSIONS. 1/4" BELOW F.F.E., SLOPE TO DRAIN.
12. WORK STATION, BY OWNER.
13. FENCING AND GATE BY OWNER.
14. PROVIDE WALL OFFSET MOUNTED TRANSPARENT STRIP CURTAIN DOOR.

WALL TYPES

1. EXTERIOR WALL - METAL WALL PANEL ON METAL BUILDING MANUFACTURER'S GIRTS AND STRUCTURAL SYSTEM. R-19 BATT INSULATION AND LINER PANELS ON INTERIOR FACES FULL HEIGHT OF WALL.
2. INTERIOR WALL - (5" NOM.) 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON EACH SIDE TO 10'-0" A.F.F.
3. INTERIOR WALL - (7" NOM.) 5 3/8" METAL STUD WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON EACH SIDE AND UNFACED R-19 BATT INSULATION. PROVIDE TO HEIGHT NOTED FULL HEIGHT WALLS TO STRUCTURE WITHIN 6" OF STRUCTURE AND BRACE WITH SLIP CONNECTION.
4. INTERIOR WALL - METAL WALL LINER PANELS ON METAL BUILDING MANUFACTURER'S GIRTS AND STRUCTURAL SYSTEM - R19 BATT INSULATION.
5. FENCE WALL - 8' HIGH CHAINLINK FENCE WALL, SEE DETAILS ON SHEET A-1-500.
6. 1-HOUR WALL - (7" NOM.) 5 5/8" METAL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON BOTH SIDES AND UNFACED R-19 BATT INSULATION. FULL HEIGHT WITH 2" DEFLECTION TRACK AT BOTTOM OF STRUCTURE.
7. FURRED WALL - 3 5/8" STEEL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON OCCUPIED SIDE. AT TYPE 1 WALLS, DELETE INTERIOR LINER PANELS IN THIS AREA.
8. FURRED WALL - 6" STEEL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON OCCUPIED SIDE. AT TYPE 1 WALLS, DELETE INTERIOR LINER PANELS IN THIS AREA.
9. INTERIOR WALL - (7" NOM.) 5 3/8" METAL STUD WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON EACH SIDE AND UNFACED R-19 BATT INSULATION. PROVIDE FULL HEIGHT WALLS TO STRUCTURE WITHIN 6" OF STRUCTURE AND BRACE WITH 2" DEFLECTION TRACK TO CEILING.



KEYPLAN

0' 4' 8' 16' 24'
SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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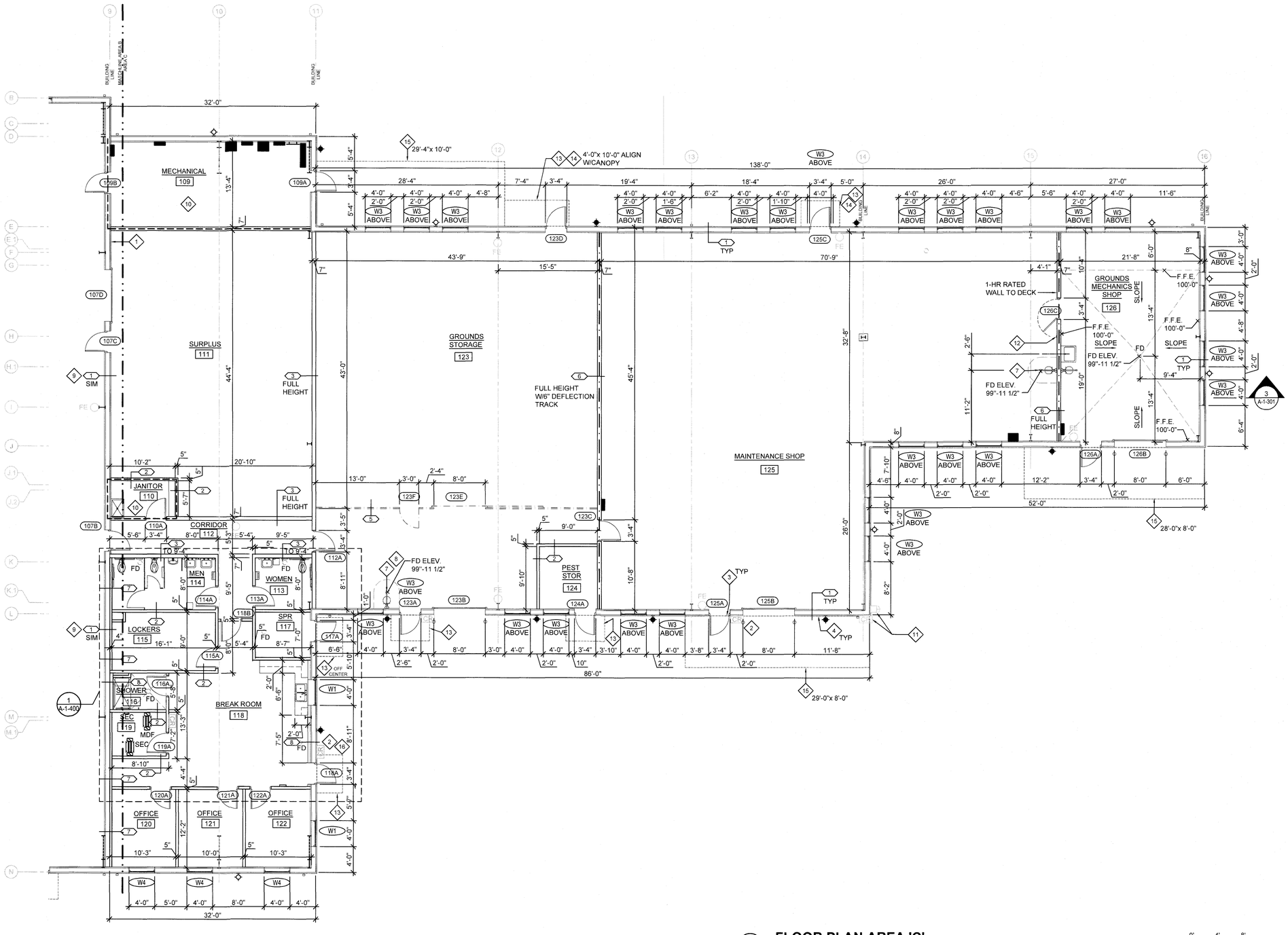
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
FLOOR PLAN AREA 'A' AND 'B'

SEAL: STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK — NO. 21911 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	A-1-101
REVISION	△

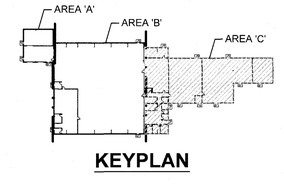
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FLOOR PLAN AREA 'C'

1 / A1-102 — SCALE: 1/8" = 1'-0"

SCALE: 1" = 8'



KEYPLAN

CONSTRUCTION NOTES

1. SEE ELEVATIONS FOR LOCATIONS OF WINDOWS ABOVE.
2. PROVIDE CARD READER SYSTEM LINKED TO WV PROTECTIVE SERVICES CARD ACCESS SYSTEM.
3. CUT CONCRETE CURB AT PERSONNEL AND OVERHEAD DOORS TO PROVIDE DRAINING SILL TYPICAL, SEE 2/A-1-500.
4. OVERLAP METAL BUILDING SYSTEM OVER CURB 1" MIN., TYPICAL, SEE 1/A-1-500.
5. INSULATE ENTIRE WALL AND PROVIDE LINER PANELS ABOVE AND BELOW ROOF ON OPPOSITE SIDE OF WALL.
6. SINGLE FIXED SCISSOR GATE 10'-0"W x 6'-0"H EXTENDED HEIGHT WITH LOCKING BAR, BEARING WASHER, 9" OFFSET INSTALLATION BRACKETS, SCHOOL STRAP, AND GATE HANDLE.
7. AT EYEWASH STATIONS SLOPE FLOOR TO FLOOR DRAIN WITH DRAIN 1/2" BELOW F.F.E. SEE 9/A-1-500 FOR TYPICAL DETAIL.
8. ALIGN EDGE OF FLOOR SLOPE WITH DOOR. DO NOT OVERLAP.
9. PROVIDE INSULATION AND PROVIDE LINER PANELS ON BOTH SIDES OF GIRTS BELOW LOWER ROOF AREA.
10. PROVIDE SMOKE PARTITIONS FOR INTERIOR WALLS AND CEILINGS IN THIS ROOM. SEAL PENETRATIONS AND OPENINGS.
11. CARD READER AND BUTTON RELEASE FOR ROLLING GATE SYSTEM.
12. MAGNETIC HOLD OPEN TIED TO FIRE ALARM SYSTEM. (NOT REQUIRED IN PHASE 1)
13. WALL MOUNTED HANGING CANOPY SYSTEM WITH INTEGRAL DRAWS AT 8'-6" TO B/O CANOPY. CENTER OVER DOOR, TYPICAL, 4'-0"x 6'-0" U.N.O., TYPICAL.
14. PROVIDE CONCRETE PAD MATCHING CANOPY DIMENSIONS 1/4" BELOW F.F.E., SLOPE TO DRAIN.
15. STRUCTURAL CANOPY WITH CANTILEVERED BEAMS INTEGRATED INTO METAL BUILDING SYSTEM, PROVIDE SOFFITS.
16. KNOX BOX "KNOXVAULT 4416", SINGLE LOCK, DARK BRONZE, RECESSED, WITH TAMPER ALERT, AS REQUIRED BY CHARLESTON FIRE DEPARTMENT WITH ENTRY ACCESS KEYS/CREDENTIALS FOR EMERGENCY ACCESS.

WALL TYPES

1. EXTERIOR WALL - METAL WALL PANEL ON METAL BUILDING MANUFACTURER'S GIRTS AND STRUCTURAL SYSTEM. R-19 BATT INSULATION AND LINER PANELS ON INTERIOR FACES FULL HEIGHT OF WALL.
2. INTERIOR WALL - (5" NOM.) 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON EACH SIDE TO 10'-0" A.F.F.
3. INTERIOR WALL - (7" NOM.) 5 3/8" METAL STUD WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON EACH SIDE AND UNFACED R-19 BATT INSULATION. PROVIDE TO HEIGHT NOTED FULL HEIGHT WALLS TO STRUCTURE WITHIN 6" OF STRUCTURE AND BRACE WITH SLIP CONNECTION.
4. INTERIOR WALL - METAL WALL LINER PANELS ON METAL BUILDING MANUFACTURER'S GIRTS AND STRUCTURAL SYSTEM - R19 BATT INSULATION.
5. FENCE WALL - 8' HIGH CHAINLINK FENCE WALL, SEE DETAILS ON SHEET A-1-500.
6. 1-HOUR WALL - (7" NOM.) 5 5/8" METAL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON BOTH SIDES AND UNFACED R-19 BATT INSULATION. FULL HEIGHT WITH 2" DEFLECTION TRACK AT BOTTOM OF STRUCTURE, U.N.O.
7. FURRED WALL - 3 5/8" STEEL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON OCCUPIED SIDE. AT TYPE 1 WALLS, DELETE INTERIOR LINER PANELS IN THIS AREA.
8. FURRED WALL - 6" STEEL STUDS AT 16" O.C. WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON OCCUPIED SIDE. AT TYPE 1 WALLS, DELETE INTERIOR LINER PANELS IN THIS AREA.
9. INTERIOR WALL - (7" NOM.) 5 3/8" METAL STUD WITH 5/8" TYPE 'X' IMPACT RESISTANT GYPSUM BOARD ON EACH SIDE AND UNFACED R-19 BATT INSULATION. PROVIDE FULL HEIGHT WALLS TO STRUCTURE WITHIN 6" OF STRUCTURE AND BRACE WITH 2" DEFLECTION TRACK TO CEILING.

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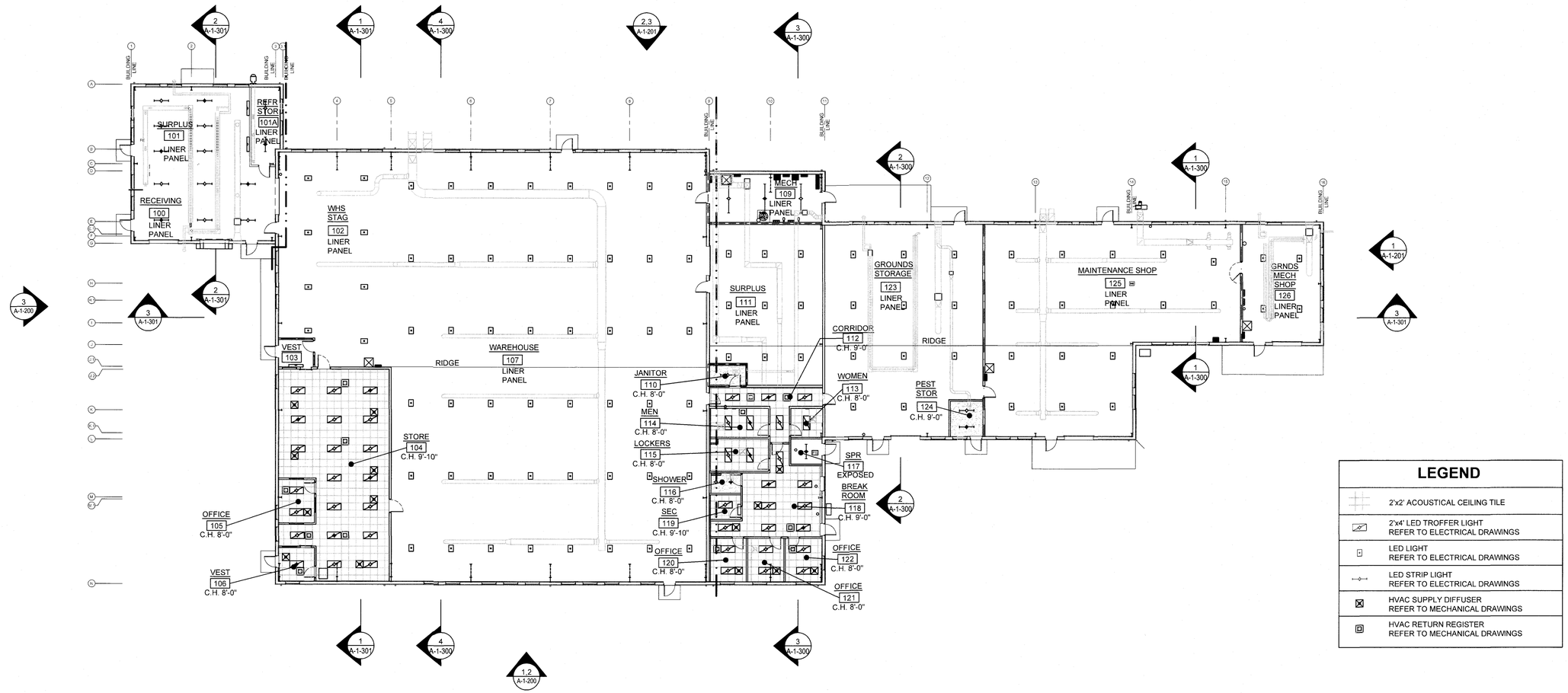
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
FLOOR PLAN AREA 'C'

SEAL — STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK NO. 9021 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
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DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	A-1-102
REVISION	△

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LEGEND

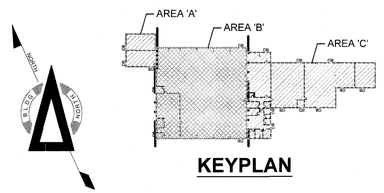
	2'x2' ACOUSTICAL CEILING TILE
	2'x4' LED TROFFER LIGHT REFER TO ELECTRICAL DRAWINGS
	LED LIGHT REFER TO ELECTRICAL DRAWINGS
	LED STRIP LIGHT REFER TO ELECTRICAL DRAWINGS
	HVAC SUPPLY DIFFUSER REFER TO MECHANICAL DRAWINGS
	HVAC RETURN REGISTER REFER TO MECHANICAL DRAWINGS

1 A-1-100 REFLECTED CEILING PLAN

SCALE: 1/16" = 1'-0"

0' 8' 16' 32' 48'

SCALE: 1" = 16'



KEYPLAN

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Chapman Technical Group, a division of GRW

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
REFLECTED CEILING PLAN

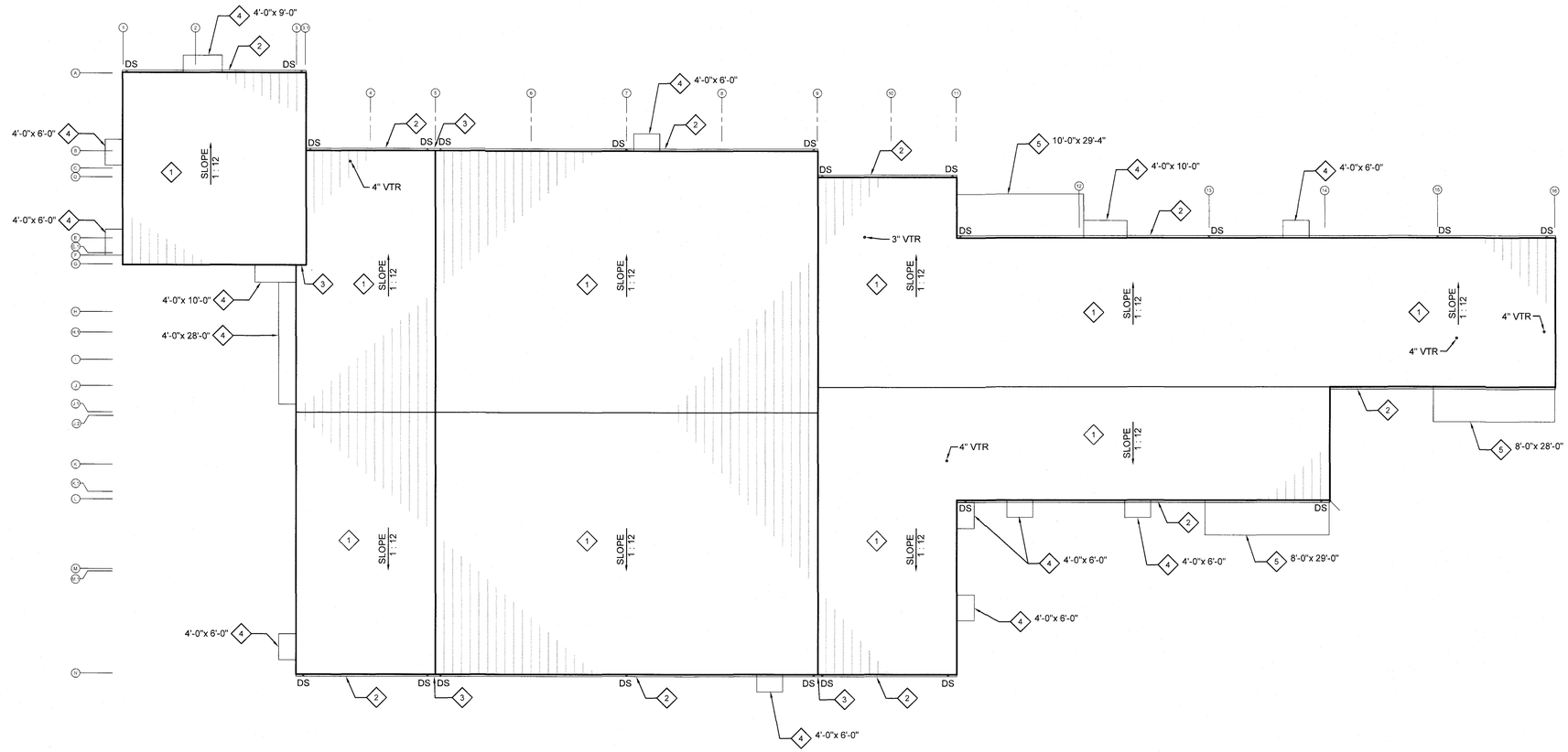
SEAL: STATE OF WEST VIRGINIA, PHILLIP ALAN WARWICK, NO. 9810, REGISTERED ARCHITECT, 6/16/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
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SHEET NO.	A-1-103
REVISION	

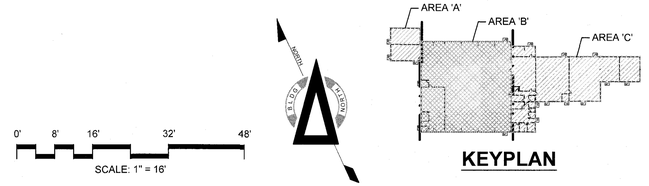
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CONSTRUCTION NOTES

1. STANDING SEAM ROOF SYSTEM.
2. 6" x 6" BOX GUTTERS, MINIMUM, TYPICAL.
3. PROVIDE CRICKET TO DIVERT WATER.
4. HANGING CANOPY ABOVE PERSONNEL DOORS WITH SUB FRAMING TO GIRTS.
5. STRUCTURAL CANOPY TIED TO METAL BUILDING STRUCTURAL SYSTEM.



1 / A-1-104 **ROOF PLAN**
SCALE: 1/16" = 1'-0"



KEYPLAN

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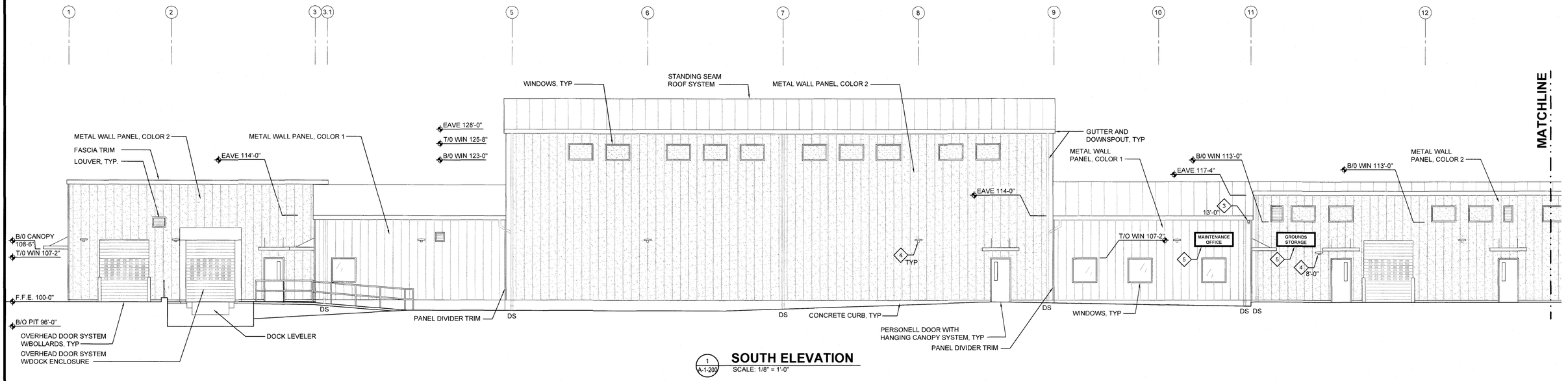
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
ROOF PLAN

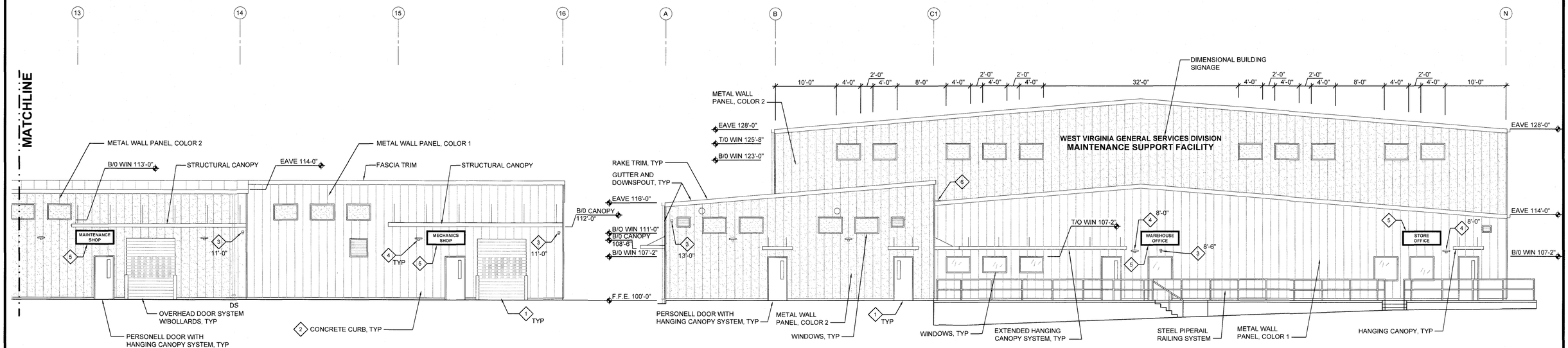
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 8921
REGISTERED ARCHITECT

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-104	

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1 A-1-200 **SOUTH ELEVATION**
SCALE: 1/8" = 1'-0"



2 A1-200 **SOUTH ELEVATION (CONT.)**
SCALE: 1/8" = 1'-0"

9 A1-200 **WEST ELEVATION**
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

1. CUT CONCRETE CURBS AT PERSONELL AND OVERHEAD DOORS TO PROVIDE DRAINING SILL, TYPICAL, SEE 2/A-1-500.
2. OVERLAP METAL BUILDING SYSTEM OVER CURB 1" MIN., TYPICAL, SEE 1/A-1-500.
3. SECURITY CAMERA, MOUNT TOP OF CAMERA AS NOTED. SEE ELECTRICAL.
4. BUILDING LIGHTING, MOUNT AT 10'-0" A.F.F. U.N.O. SEE ELECTRICAL.
5. BUILDING SIGNAGE, SEE 8/A-1-500 FOR INFORMATION, BY OWNER.
6. PROVIDE CRICKET TO DIVERT WATER, SEE ROOF PLAN.

0' 4' 8' 16' 24'
SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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Buckhannon, WV
(304) 472-8914
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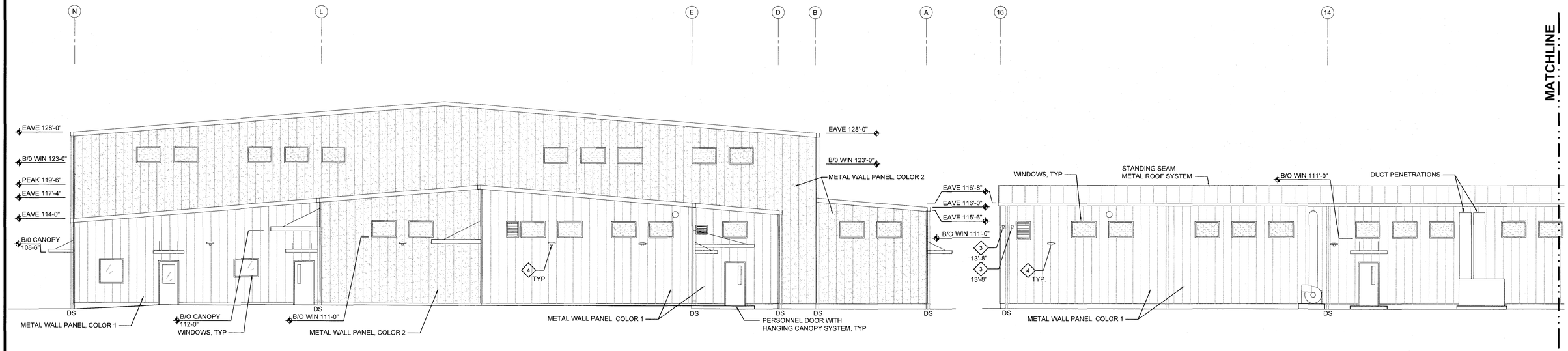
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
ELEVATIONS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 35211
REGISTERED ARCHITECT
8/6/2021

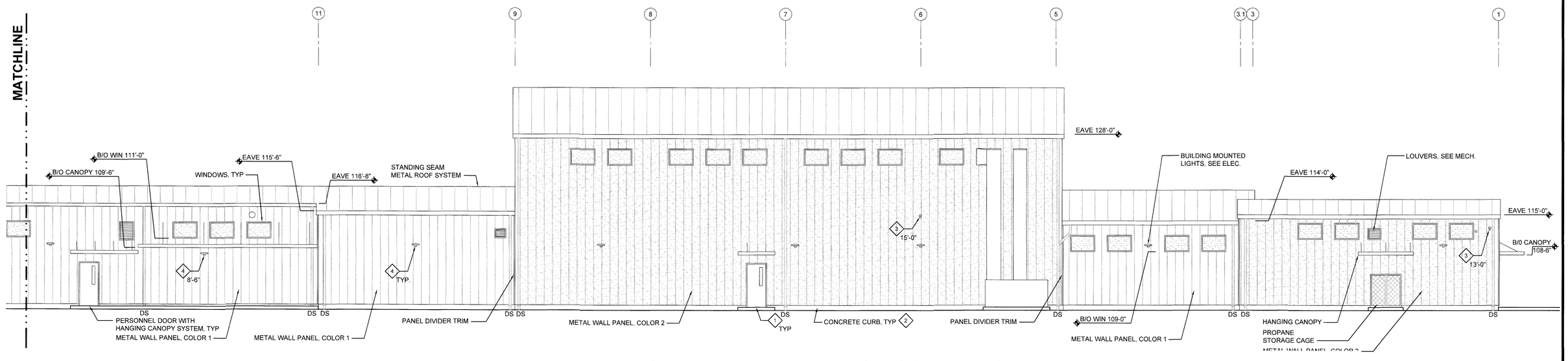
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-200	

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1 A-1-201 **EAST ELEVATION**
SCALE: 1/8" = 1'-0"

2 A-1-201 **NORTH ELEVATION (CONT)**
SCALE: 1/8" = 1'-0"



3 A-1-201 **NORTH ELEVATION (CONT)**
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

X

1. CUT CONCRETE CURBS AT PERSONNEL AND OVERHEAD DOORS TO PROVIDE DRAINING SILL, TYPICAL, SEE 2/A-1-500.
2. OVERLAP METAL BUILDING SYSTEM OVER CURB 1" MIN., TYPICAL, SEE 1/A-1-500.
3. SECURITY CAMERA, MOUNT TOP OF CAMERA AS NOTED. SEE ELECTRICAL.
4. BUILDING LIGHTING, MOUNT AT 10'-0" A.F.F. U.N.O. SEE ELECTRICAL.

0' 4' 8' 16' 24'
SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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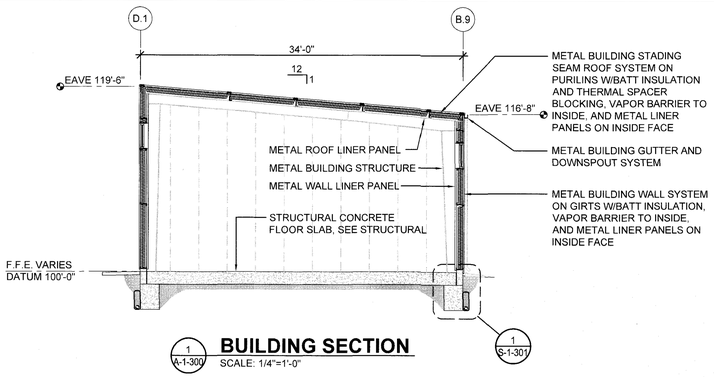
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY WAREHOUSE/GROUNDS BUILDING ELEVATIONS

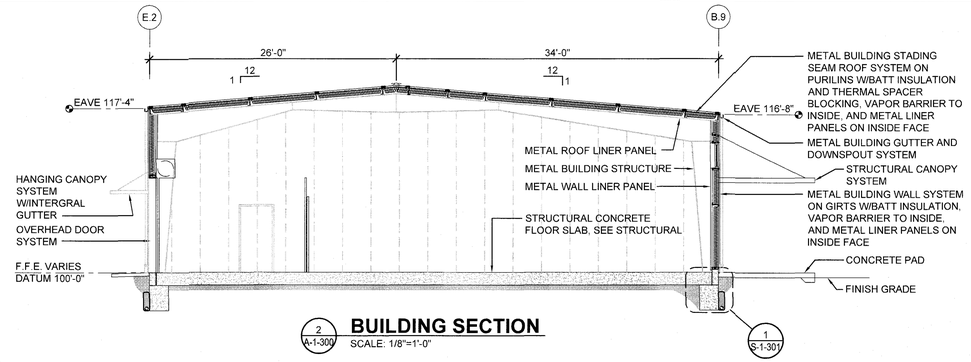
PHILLIP ALAN WARNOCK NO. 9327 STATE OF WEST VIRGINIA REGISTERED ARCHITECT 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-201	

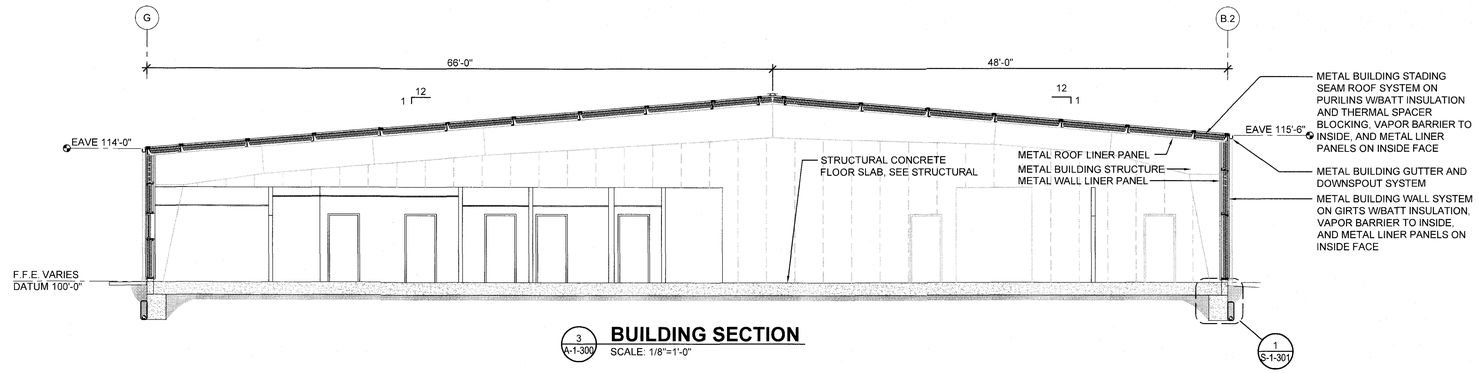
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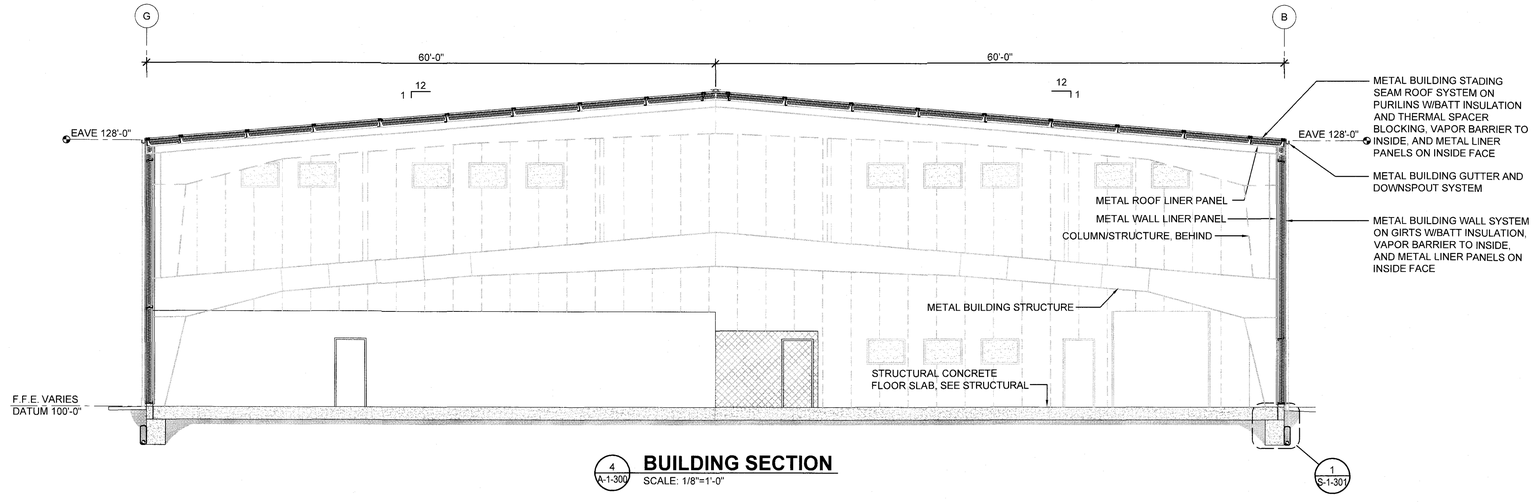
BUILDING SECTION
SCALE: 1/4"=1'-0"



BUILDING SECTION
SCALE: 1/8"=1'-0"



BUILDING SECTION
SCALE: 1/8"=1'-0"



BUILDING SECTION
SCALE: 1/8"=1'-0"

0' 4' 8' 16' 32'
SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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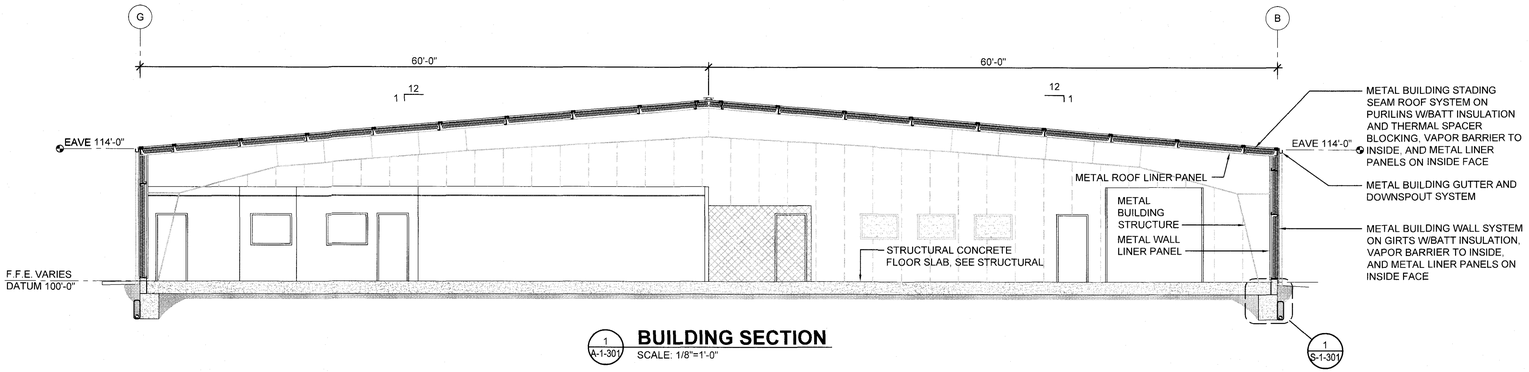
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
BUILDING SECTIONS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 24224
REGISTERED ARCHITECT
6/6/2021

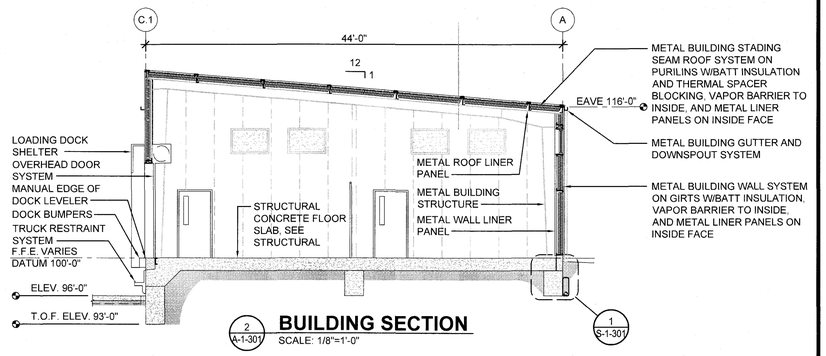
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-300	

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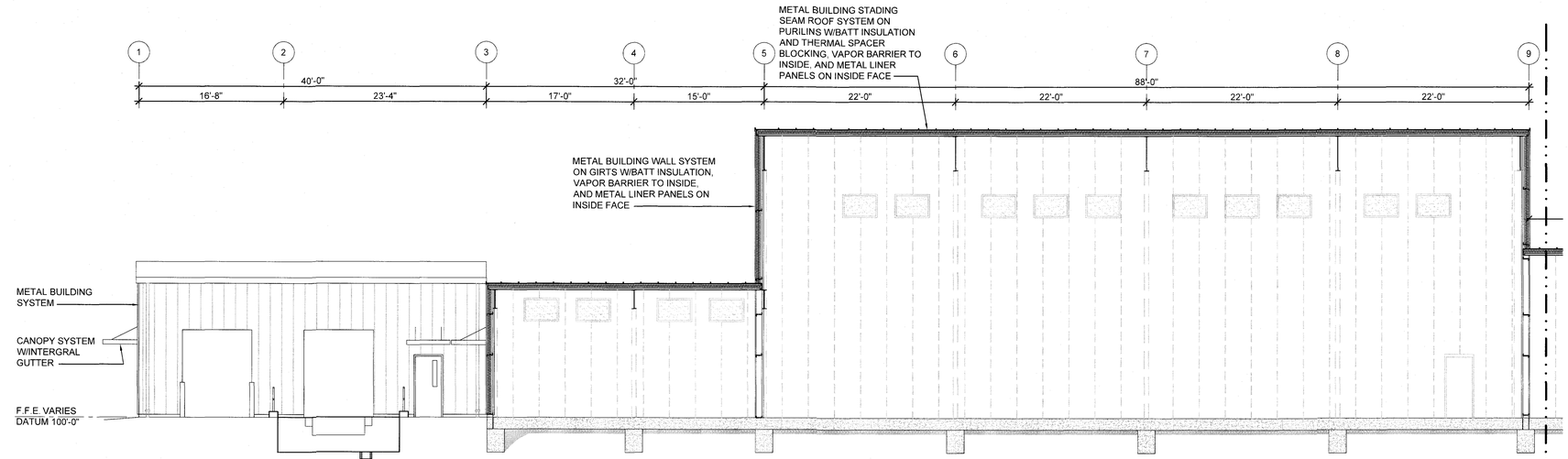
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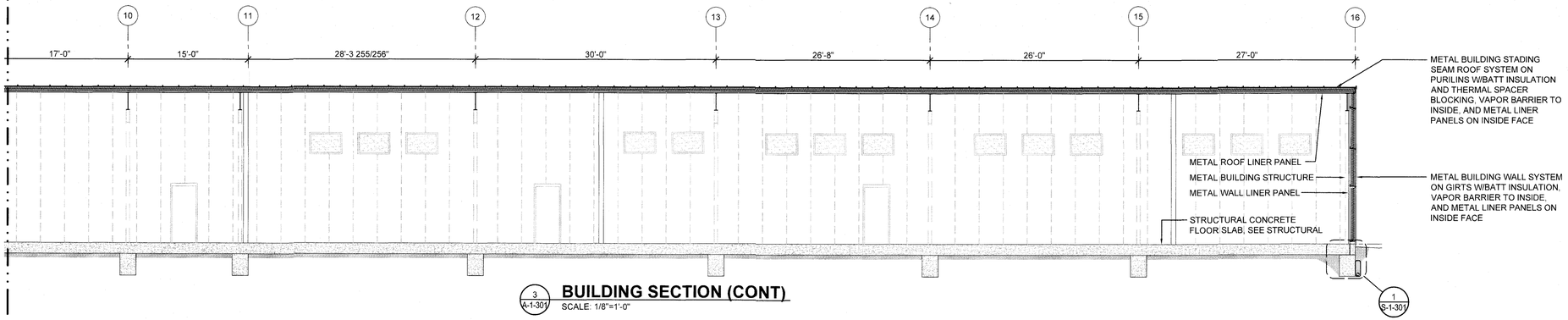
BUILDING SECTION

SCALE: 1/8"=1'-0"



BUILDING SECTION (CONT)

3 A-1-301 SCALE: 1/8"=1'-0"



BUILDING SECTION (CONT)

SCALE: 1/8"=1'-0"

0' 4' 8' 16' 32'

SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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PROJECT INFORMATION

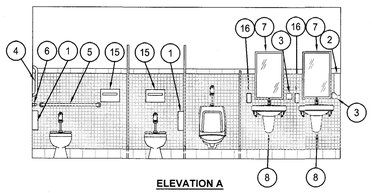
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
BUILDING SECTIONS

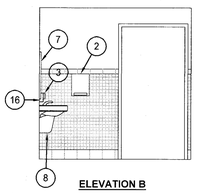
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 16324
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-301	

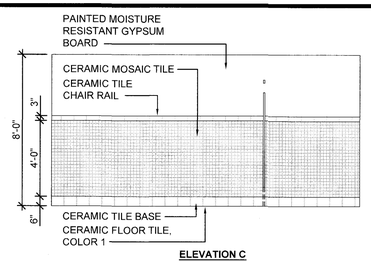
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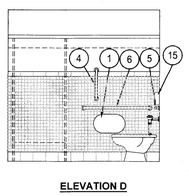
ELEVATION A



ELEVATION B



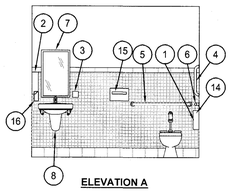
ELEVATION C



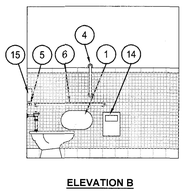
ELEVATION D

2 A-1-400 MENS TOILET ELEVATIONS

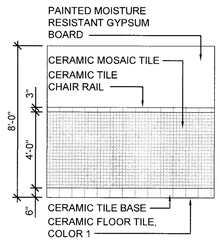
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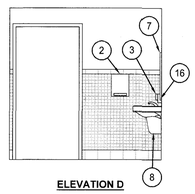
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ELEVATION B



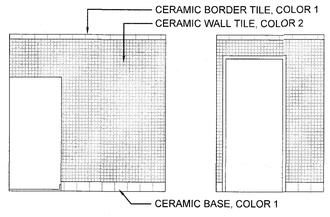
ELEVATION C



ELEVATION D

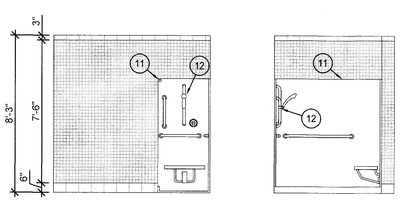
3 A-1-400 WOMENS TOILET ELEVATIONS

SCALE: 1/4" = 1'-0"



ELEVATION A

ELEVATION B

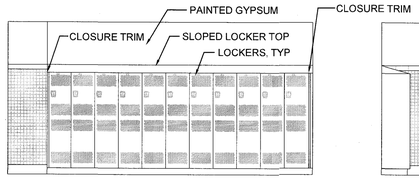


ELEVATION C

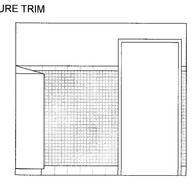
ELEVATION D

4 A-1-400 SHOWER ELEVATIONS

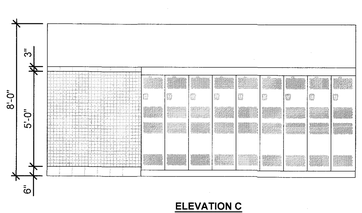
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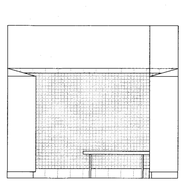
ELEVATION A



ELEVATION B



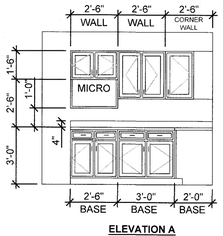
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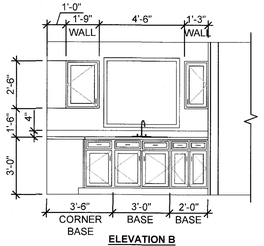
ELEVATION D

5 A-1-400 LOCKER ROOM ELEVATIONS

SCALE: 1/4" = 1'-0"



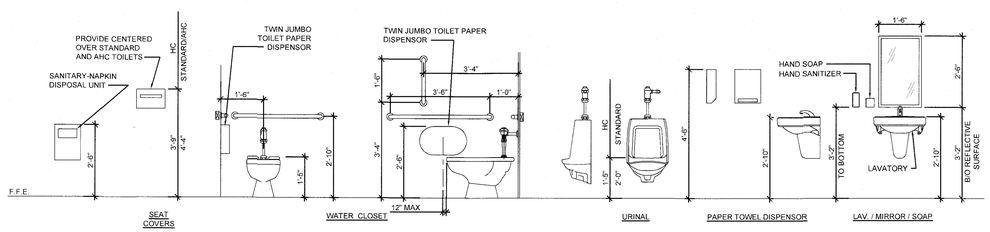
ELEVATION A



ELEVATION B

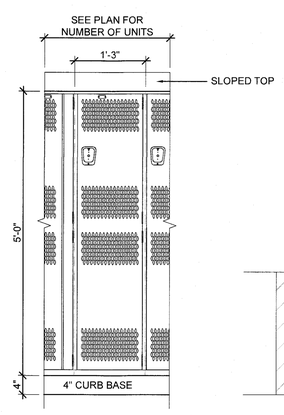
6 A-1-400 BEAKROOM ELEVATIONS

SCALE: 1/4" = 1'-0"

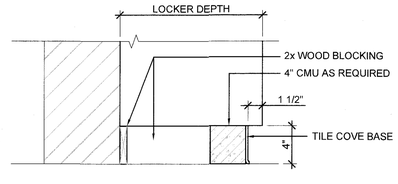


TYPICAL MOUNTING HEIGHTS

SCALE: 3/8" = 1'-0"



LOCKER ELEVATION (18" DEEP)



TYPICAL LOCKER BASE SECTION

NOTES:
1. PROVIDE A MINIMUM OF ONE ADA COMPLIANT LOCKER IN EACH LOCKER ROOM.
2. INCLUDE SLOPED TOP, FRONT AND CORNER FILLER PLATES AS REQUIRED.
3. RETURN CMU AND COVE BASE TO WALL WHEN SIDE OF LOCKER IS EXPOSED.
4. PROVIDE 2x WOOD BLOCKING AS REQUIRED TO FASTEN AND STABILIZE LOCKERS.

7 A-1-400 LOCKER DETAILS

SCALE: NTS

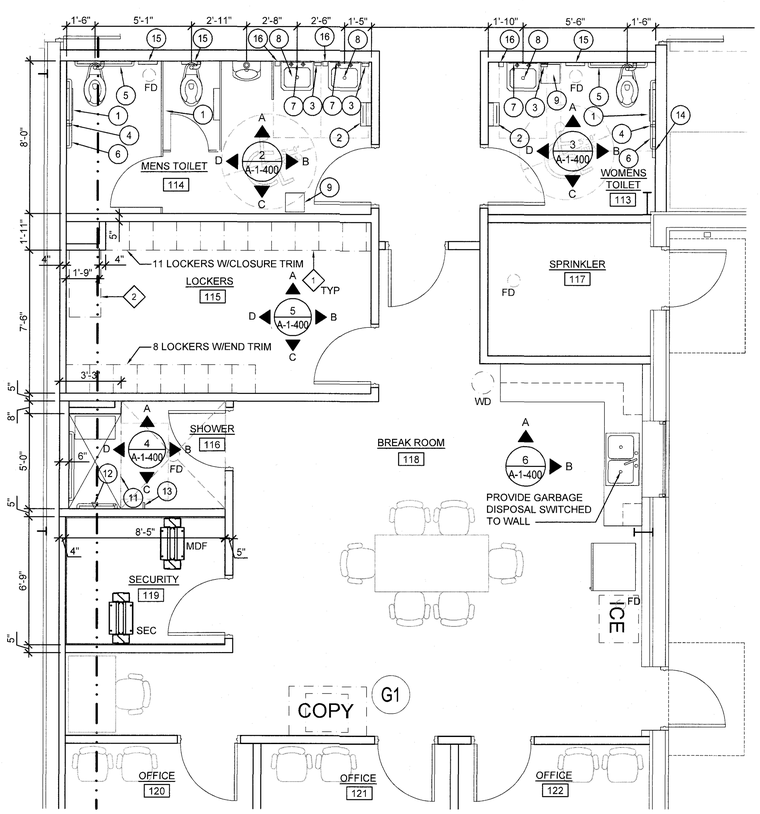
TOILET ACCESSORIES SCHEDULE

SYMBOL	DESCRIPTION	MOUNTING HGTS	MFG	MODEL	REMARKS
1	TOILET PAPER DISPENSER, JRT JR JUMBO ROLL	22" TO CENTER	KIMBERLY CLARK	0950700	SURFACE MOUNTED,BLACK,W/STUB ROLL,NOTE 2
2	TOUCHLESS ROLL TOWEL DISPENSER	54" TO TOP	GEORGIA PACIFIC	59462	"enMOTION", TRANSLUCENT SMOKE, NOTE 2
3	TOUCHLESS SOAP DISPENSER	51" TO TOP	GOJO	LTX-12 1984-511	SURFACE MOUNTED, W/BROWN NOZZLE, NOTE 2
4	18" VERTICAL GRAB BAR	40" TO BOTTOM	BOBRICK	B-6806.9918	CONCEALED MOUNTING
5	36" GRAB BAR	34" TO CENTER	BOBRICK	B-6806.99 36	CONCEALED MOUNTING
6	42" GRAB BAR	34" TO CENTER	BOBRICK	B-6806.99 42	CONCEALED MOUNTING
7	MIRROR 18" X 30"	38" TO BOTTOM	BOBRICK	B-290 1830	SURFACE MOUNTED
8	UNDER LAVITORY GUARD	-	-	-	PLASTIC
9	TRASH CAN	-	-	-	BY OWNER
10	MOP AND BROOM HOLDER	66" TO CENTER	BOBRICK	B-224	LOCATED AT SERVICE SINK IN JAN 110
11	SHOWER BAR	6'-8" A.F.F. CLEAR	BOBRICK	-	SURFACE MOUNTED, PART OF 12
12	ACCESSIBLE SHOWER EQUIPMENT	MFR'S ADA	BOBRICK	HN300	SEE NOTE 1
13	ROBE HOOK	MFR'S ADA AND 60" A.F.F.	BOBRICK	B-212	SURFACE MOUNTED
14	TOUCHLESS SANITARY NAPKIN RECEPTACLE	MFR'S ADA	BOBRICK	BOB-270	SURFACE MOUNTED, STAINLESS STEEL
15	SEAT COVER DISPENSER	MFR'S ADA	GEORGIA PACIFIC	57710	SURFACE MOUNTED, STAINLESS STEEL, NOTE 2
16	HAND SANITIZER DISPENSER	MFR'S ADA	PURELL	TFX 2720-01	SURFACE MOUNTED, NOTE 2

NOTE:
1. INCLUDES SHOWER HEAD, DIVERTER VALVE, HANDHELD SHOWER SPRAY, FLOW CONTROL, GRAB BARS, BARRIER FREE SEAT AND SHOWER CURTAIN.
2. TOILET ACCESSORY PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR.

X CONSTRUCTION NOTES

1. 15"W x 18"D METAL LOCKER SYSTEM, SEE DETAIL 7/A-1-400.
2. 42"x 20" WOOD BENCH.



1 A-1-400 ENLARGED TOILETS/BREAKROOM PLAN

SCALE: 1/4" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

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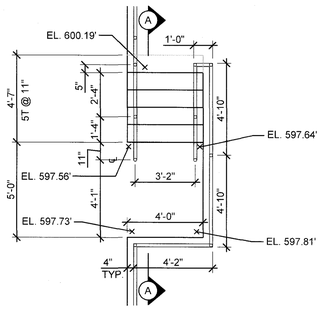
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
TOILET ROOM PLANS, DETAILS AND SCHEDULES

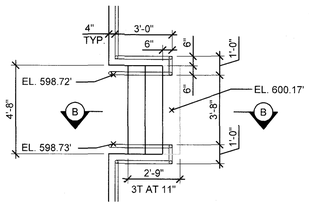
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
No. 21401
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	A-1-400
REVISION	

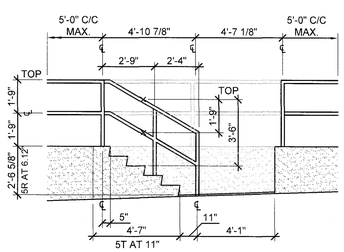
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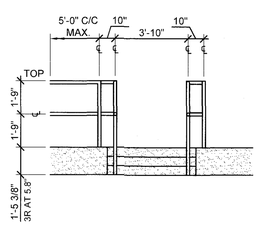
PLAN



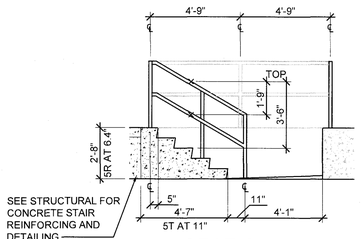
PLAN



ELEVATION

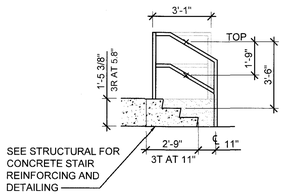


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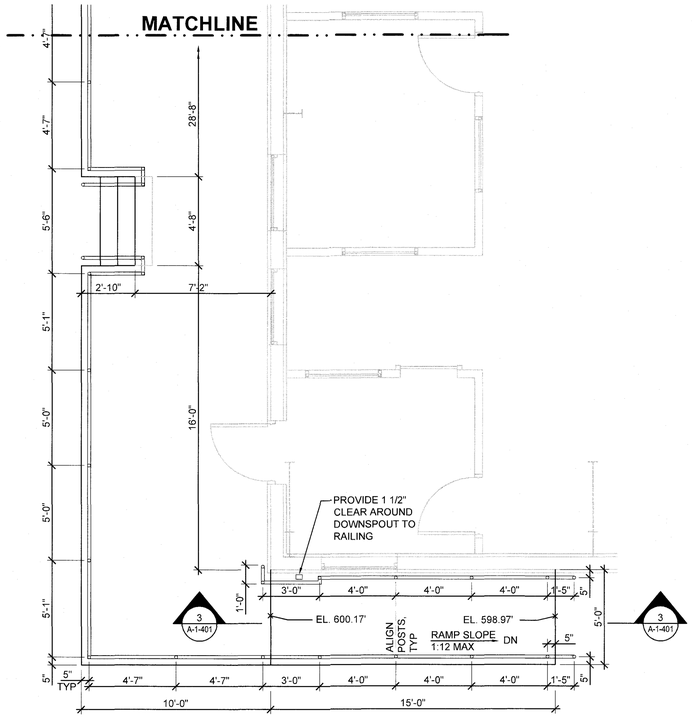
SECTION A-A

5 A-1-401 **STAIR DETAILS**
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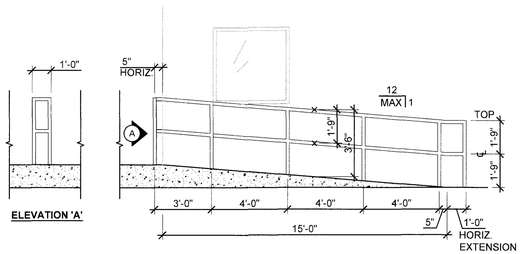


SECTION B-B

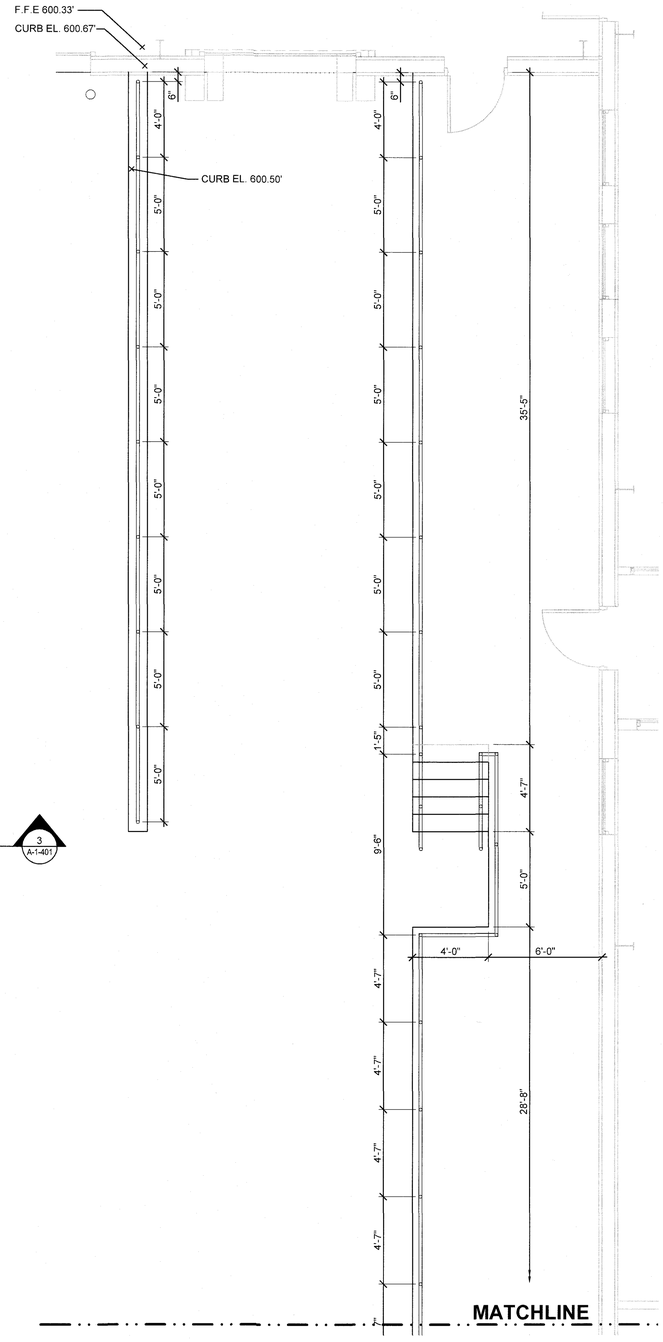
4 A-1-401 **STAIR DETAILS**
SCALE: 1/4"=1'-0"



2 A-1-401 **HANDRAIL PLAN**
SCALE: 1/4"=1'-0"



3 A-1-401 **ELEVATION**
SCALE: 1/4"=1'-0"



1 A-1-401 **HANDRAIL PLAN**
SCALE: 1/4"=1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

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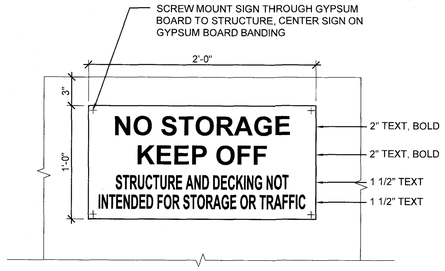
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
STAIRS AND RAILING
PLANS AND DETAILS

STATE OF WEST VIRGINIA
PHILLIP W. ALAIMO
PROVIDENCE 9321
REGISTERED ARCHITECT
8/6/2021

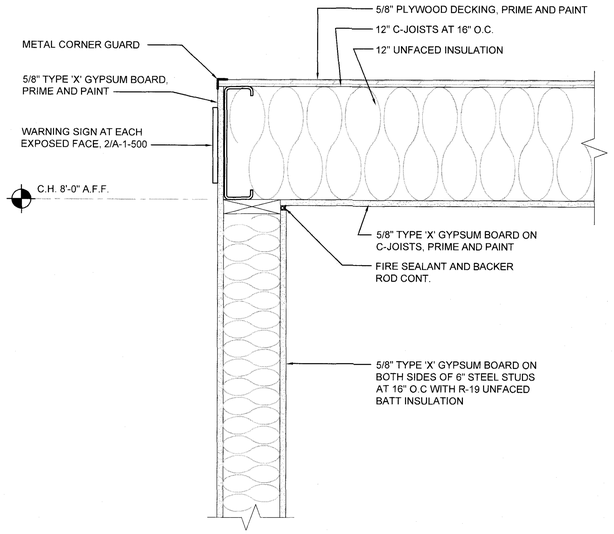
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-401	△

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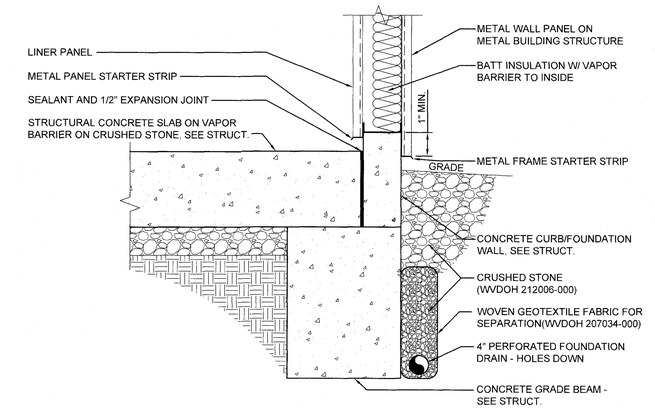


NOTE: SIGN TO BE PLASTIC W/RED LETTERS ON WHITE BACKGROUND. TEXT TO BE HELVETICA, SIZED AS NOTED, CENTERED ON SIGN

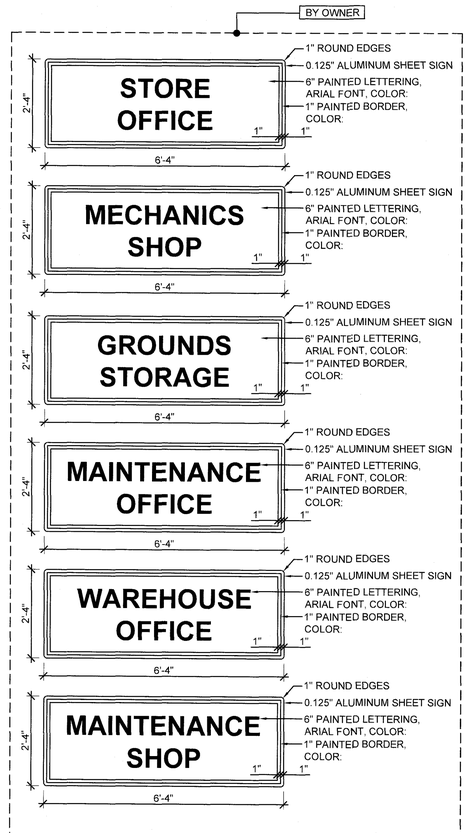
4 A-1-500 WARNING SIGN ELEVATION
SCALE : 1 1/2"=1'-0"



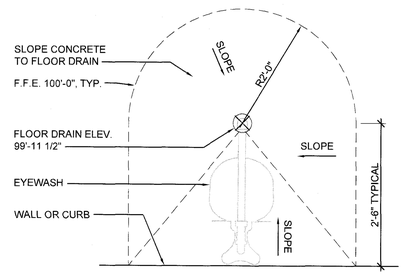
3 A-1-500 WALL/CEILING AT ROOM 124 AND 110
SCALE: 1 1/2"= 1'-0"



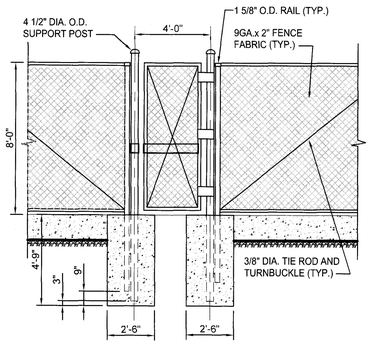
1 A-1-500 SECTION
SCALE: 3\4" = 1'-0"



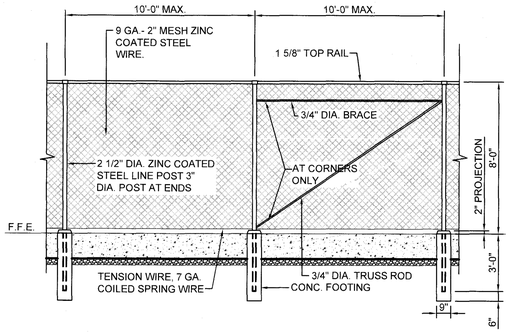
8 A-1-500 BUILDING SIGNAGE
SCALE : 1 1/2"=1'-0"



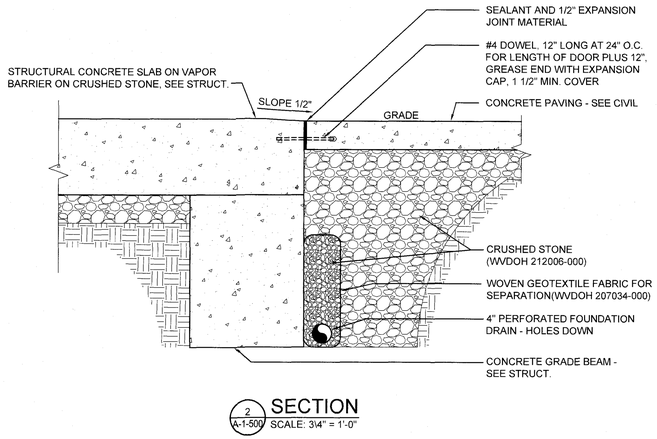
9 A-1-500 EYEWASH DETAIL
SCALE: 3/4"=1'-0"



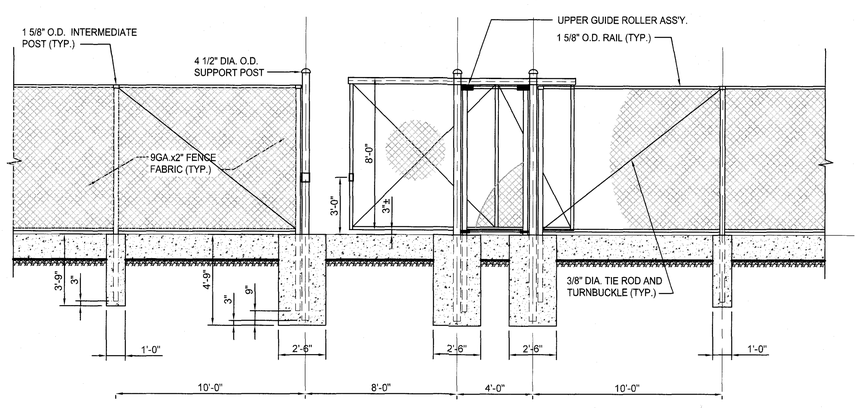
7 A-1-500 EGRESS FENCE GATE ELEVATION
SCALE: 1/4" = 1'-0"



6 A-1-500 INTERIOR 8' CHAIN LINK FENCE DETAIL
NO SCALE



2 A-1-500 SECTION
SCALE: 3\4" = 1'-0"



5 A-1-500 CANTILEVER SLIDE GATE ELEVATION
SCALE: 1/4" = 1'-0"

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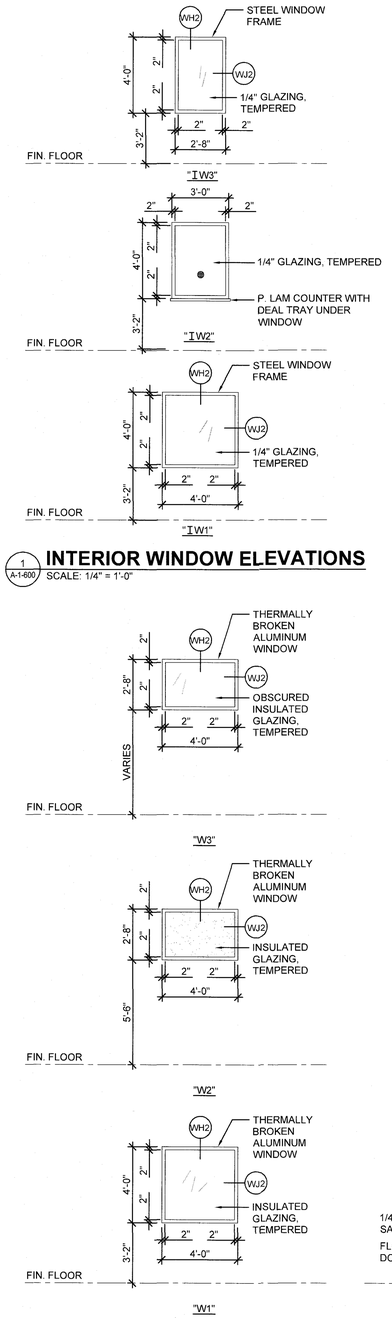
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS
DETAILS

STATE OF WEST VIRGINIA — PHILLIP ALAN WASHBURN — NO. 9924 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	REVISION
A-1-500	

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1 / A-1-600 INTERIOR WINDOW ELEVATIONS

SCALE: 1/4" = 1'-0"

ROOM FINISH SCHEDULE

RM. NO.	ROOM NAME	FLOORS	BASE	WALLS	CEILINGS	REMARKS
100	RECEIVING	CONC	-	MWP	MLP	
101	SURPLUS	CONC	-	MWP	MLP	
101A	REFRIGERANT STORAGE	CONC	-	MWP/GYP	MLP	
102	WAREHOUSE STAGING	CONC	-	MWP	MLP	
103	VESTIBULE	CONC	-/VB/-	MWP/GYP/CLF	MLP	
104	STORE	VT	-/VB	MWP/GYP	APC	
105	OFFICE	VT	-/VB	MWP/GYP	APC	
106	VESTIBULE	VT	-/VB	MWP/GYP	APC	
107	WAREHOUSE	CONC	-/VB	MWP/GYP	MLP	
109	MECHANICAL	CONC	-/VB	MWP/GYP	MLP	
110	JANITOR	CONC	-/VB	MWP/GYP	GYP	
111	SURPLUS	CONC	-/VB	MWP/GYP	MLP	
112	CORRIDOR	VT	VB	GYP	APC	
113	WOMENS TOILET	CT	CT	CT/GYP	APC	
114	MENS TOILET	CT	CT	CT/GYP	APC	
115	LOCKERS	CT	CT	CT	APC	
116	SHOWER	CT	CT	CT	GYP	
117	SPRINKLER	VT	-/VB	MWP/GYP	EXP	
118	BREAK ROOM	VT	VB	GYP	APC	
119	SECURITY	VT	VB	GYP	APC	
120	OFFICE	VT	-/VB	MWP/GYP	APC	
121	OFFICE	VT	-/VB	MWP/GYP	APC	
122	OFFICE	VT	-/VB	MWP/GYP	APC	
123	GROUNDS STORAGE	CONC	-/VB	MWP/GYP	MLP	
124	PESTICIDE STORAGE	EPOXY	EPOXY	MWP/GYP	GYP	NOTE 2
125	MANTENANCE SHOP	CONC	-/VB	MWP/GYP	MLP	
126	GROUNDS MECHANICS SHOP	CONC	-/VB	MWP/GYP	MLP	

APC	ACOUSTICAL PANEL CEILING SYSTEM	EXP	EXPOSED
CLF	CHAIN LINK FENCE	GYP	PAINTED GYPSUM BOARD
CONC	SEALED CONCRETE	MWP	METAL WALL PANEL
CT	CERAMIC TILE/EPOXY GROUT	MLP	METAL LINER PANEL
EPOXY	EPOXY FLOOR SYSTEM	VB	VINYL BASE
		VT	VINYL TILE

NOTES:

1. PROVIDE VINYL BASE AT GYPSUM BOARD WALL.
2. PROVIDE CONCRETE CURB ALL AROUND THIS ROOM. SEAL AND EXTEND EPOXY FLOOR SYSTEM UP CURB.
3. SEE REFLECTED CEILING PLAN FOR CEILING HEIGHTS.
4. SEAL ALL JOINTS AND CHANGES OF MATERIALS WITH SEALANT.

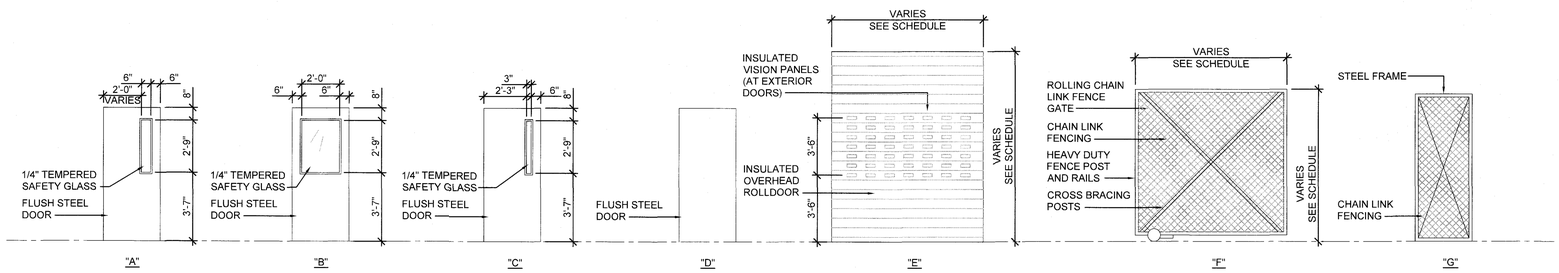
DOOR SCHEDULE

DOOR NO.	SIZE	DOOR MAT.	DOOR FINISH	DOOR ELEV.	DOOR LABEL	DOOR HDW. SET	FRAME MAT.	FRAME FINISH	FRAME TYPE	REMARKS
100A	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
100B	8'-0"x 10'-0"	GV	FAC	E	-	1	STL	PTD	-	NOTE 1,2,7
100C	8'-0"x 10'-0"	GV	FAC	E	-	1	STL	PTD	-	NOTE 1,2,7
100D	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1,9
101A	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
101B	8'-0"x 8'-0"	GV	FAC	F	-	1	GV	FAC	-	NOTE 3
101C	3'-0"x 7'-0"	GV	FAC	G	-	1	GV	FAC	-	NOTE 3
101D	3'-0"x 7'-0"	HM	PTD	A	-	17	GV	FAC	A	NOTE 4
102A	10'-0"x 10'-0"	GV	FAC	E	-	1	HM	PTD	-	NOTE 1,2,6,7
102B	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
103A	3'-0"x 7'-0"	HM	PTD	A	-	4	HM	PTD	A	NOTE 1,4
103B	3'-0"x 7'-0"	HM	FAC	B	-	10	HM	PTD	A	NOTE 9
104A	3'-4"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
104B	3'-4"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
105A	3'-0"x 7'-0"	HM	PTD	B	-	7	HM	PTD	A	
106A	3'-0"x 7'-0"	HM	PTD	A	-	4	HM	PTD	A	NOTE 1,4
106B	3'-0"x 7'-0"	HM	PTD	B	-	10	HM	PTD	A	NOTE 9
107A	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
107B	3'-0"x 7'-0"	HM	PTD	A	-	16	HM	PTD	A	NOTE 1
107C	3'-0"x 7'-0"	HM	PTD	A	-	6	HM	PTD	A	NOTE 1
107D	8'-0"x 10'-0"	GV	FAC	E	-	1	STL	PTD	-	NOTE 1,2,7
107E	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
109A	3'-0"x 7'-0"	HM	PTD	A	-	15	HM	PTD	A	NOTE 1
109B	3'-0"x 7'-0"	HM	PTD	A	-	19	HM	PTD	A	NOTE 1
110A	3'-0"x 7'-0"	HM	PTD	D	-	12	HM	PTD	A	
112A	3'-0"x 7'-0"	HM	PTD	A	-	16	HM	PTD	A	NOTE 1
113A	3'-0"x 7'-0"	HM	PTD	D	-	5	HM	PTD	A	
114A	3'-0"x 7'-0"	HM	PTD	D	-	13	HM	PTD	A	
115A	3'-0"x 7'-0"	HM	PTD	D	-	13	HM	PTD	A	
116A	3'-0"x 7'-0"	HM	PTD	D	-	5	HM	PTD	A	
117A	3'-0"x 7'-0"	HM	PTD	A	-	15	HM	PTD	A	NOTE 1
118A	3'-0"x 7'-0"	HM	PTD	B	-	4	HM	PTD	A	NOTE 1,4
118B	3'-0"x 7'-0"	HM	PTD	B	-	14	HM	PTD	A	
119A	3'-0"x 7'-0"	HM	PTD	D	-	17	HM	PTD	A	NOTE 4
120A	3'-0"x 7'-0"	HM	PTD	B	-	7	HM	PTD	A	
121A	3'-0"x 7'-0"	HM	PTD	B	-	7	HM	PTD	A	
122A	3'-0"x 7'-0"	HM	PTD	B	-	7	HM	PTD	A	
123A	3'-0"x 7'-0"	HM	PTD	A	-	4	HM	PTD	A	NOTE 1,4
123B	8'-0"x 10'-0"	GV	FAC	E	-	1	STL	PTD	-	NOTE 1,2,7
123C	3'-0"x 7'-0"	HM	PTD	A	60 MIN	16	HM	PTD	A	NOTE 1
123D	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
123E	8'-0"x 8'-0"	GV	FAC	F	-	1	GV	FAC	-	
123F	3'-0"x 7'-0"	GV	FAC	G	-	1	GV	FAC	-	NOTE 3
124A	3'-0"x 7'-0"	HM	PTD	A	-	15	HM	PTD	A	NOTE 1
125A	3'-0"x 7'-0"	HM	PTD	A	-	4	HM	PTD	A	NOTE 1,4
125B	8'-0"x 10'-0"	GV	FAC	E	-	1	STL	FAC	-	NOTE 1,2,7
125C	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
126A	3'-0"x 7'-0"	HM	PTD	A	-	10	HM	PTD	A	NOTE 1
126B	8'-0"x 10'-0"	GV	FAC	E	-	1	STL	PTD	-	NOTE 1,2,8
126C	3'-0"x 7'-0"	HM	PTD	C	60 MIN	18	HM	PTD	A	NOTE 1,5

FAC- FACTORY
GV- GALVANIZED
HM- HOLLOW METAL
INS- INSULATED
PTD- PAINTED
STL- STEEL

NOTES:

1. PROVIDE INSULATED DOOR SYSTEM.
2. PROVIDE TRIM AT ALL OVERHEAD DOORS ENCASING STEEL FRAMES.
3. PROVIDE LOCKING HASP WITH PROGRAMMABLE PADLOCK AND KEY OVERRIDE.
4. PROVIDE CARD READER SYSTEM.
5. PROVIDE WALL MOUNTED MAGNETIC HOLD OPEN AND DOOR CLOSER WITH 180° SWING. (MAGNETIC HOLD OPEN IS NOT REQUIRED UNTIL FULL OCCUPANCY IS PROVIDED.)
6. PROVIDE TRANSPARENT STRIP CURTAIN ON OPPOSITE FACE OF WALL.
7. MANUAL OVERHEAD DOOR.
8. POWERED OVERHEAD DOOR, SEE ELECTRICAL.
9. PROVIDE DOORBELL PUSHBUTTON TRANSMITTER FOR WAREHOUSE DOORBELL SYSTEM AT THIS DOOR. WAREHOUSE DOORBELL SYSTEM SHALL BE LH-4000 WIRELESS DOOR CHIMES FROM 1800DOORBELL, OR EQUAL, WITH 5,000 FT RANGE, 3 DOORBELL TRANSMITTERS, 5 RECEIVERS CAPABLE OF PLAYING 12 DISTINCT SOUND PATTERNS AND WITH 4 ADJUSTABLE VOLUME CONTROLS FROM MUTE TO 85 dB.



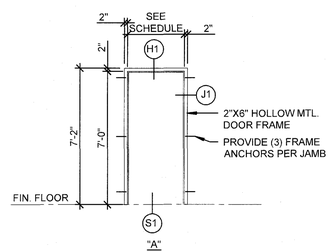
2 / A-1-600 WINDOW ELEVATIONS

SCALE: 1/4" = 1'-0"

NOTE: OVERALL DIMENSIONS SHOWN ARE FOR ROUGH OPENINGS. FIELD VERIFY ALL OPENINGS.

3 / A-1-600 DOOR ELEVATIONS

SCALE: 1/4" = 1'-0"



4 / A-1-600 DOOR FRAME TYPES

SCALE: 1/4" = 1'-0"

NOTE: OVERALL DIMENSIONS SHOWN ARE FOR ROUGH OPENINGS. FIELD VERIFY ALL OPENINGS.

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Chapman Technical Group, a division of GRW

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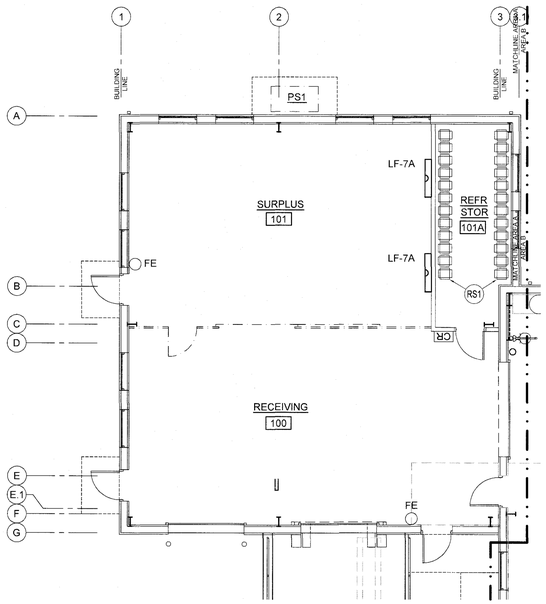
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
DOOR AND WINDOW DETAILS AND SCHEDULES

SEAL: STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK NO. 3621 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
CHECKED BY:	PAW
SHEET NO.	A-1-600
REVISION	△

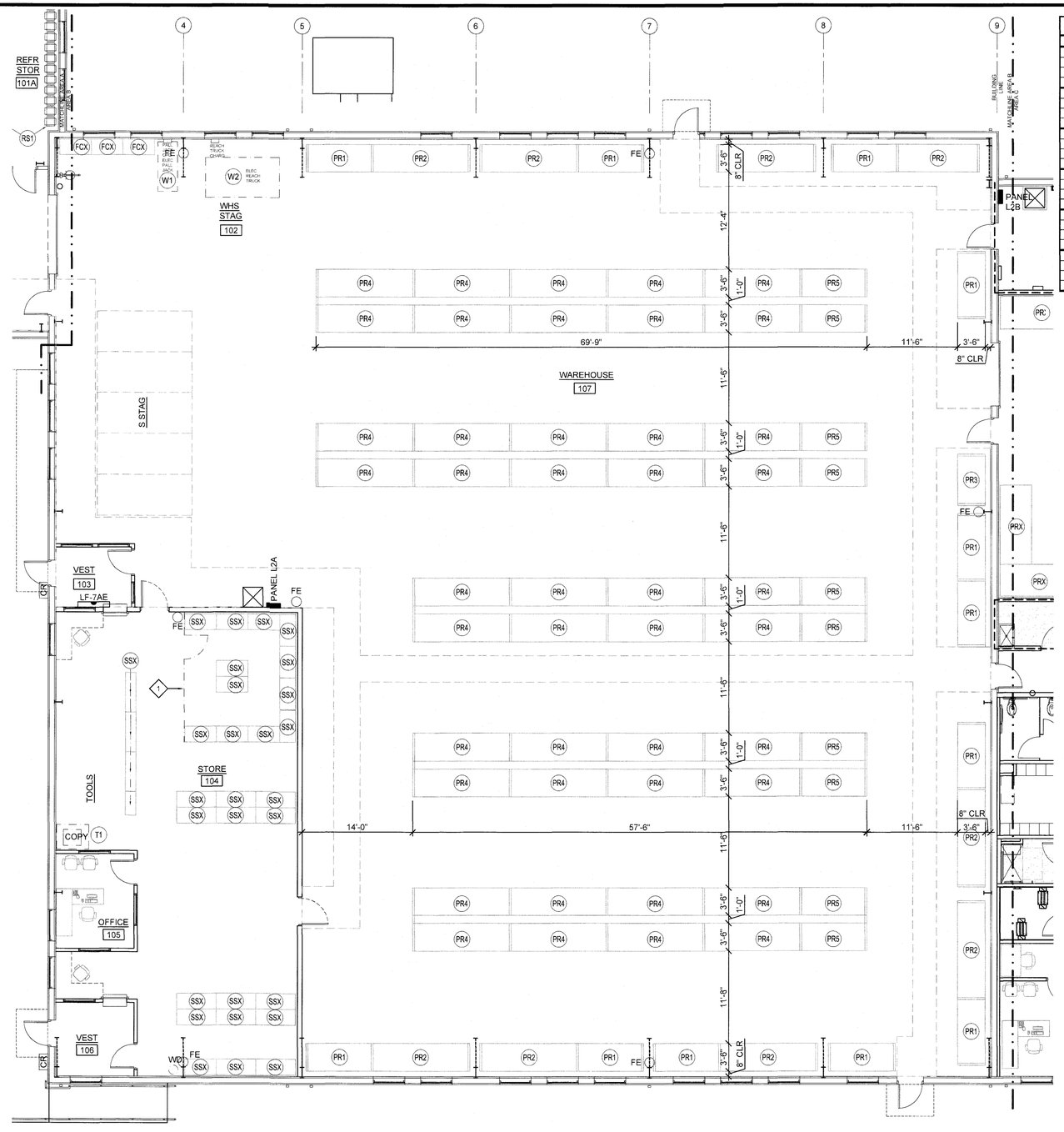
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1 A-1-102 **EQUIPMENT PLAN AREA 'A'**
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

1. FENCING AND GATE BY OWNER.

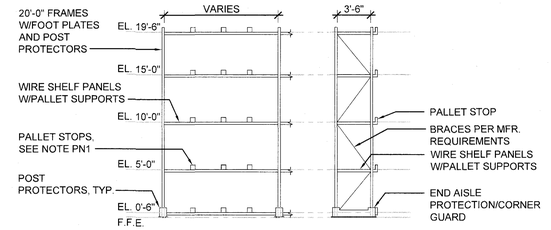


2 A-1-100 **EQUIPMENT PLAN AREA 'B'**
SCALE: 1/8" = 1'-0"

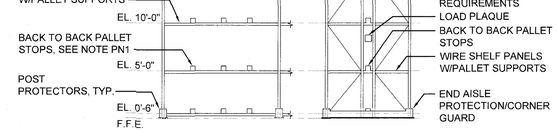
EQUIPMENT SCHEDULE

ITEM	INV. TAG	DESCRIPTION	MFG	MODEL	WIDTH	DEPTH	HEIGHT	WEIGHT	POWER
FCX		EXIST. FIRE CABINET							NOTE 4
PR1		PALLET RACK			8'-0"	42"	20'-0"		NOTE 2
PR2		PALLET RACK			12'-0"	42"	20'-0"		NOTE 2
PR3		PALLET RACK			6'-0"	42"	20'-0"		NOTE 2
PR4		PALLET RACK			12'-0"	42"	20'-0"		NOTE 3
PR5		PALLET RACK			8'-0"	42"	20'-0"		NOTE 3
PRX		EXIST. PALLET RACK							NOTE 4
PS1		PROPANE STORAGE UNIT							NOTE 4
RS1		REFRIG STORAGE RACK							NOTE 4
SSX		EXIST. STORAGE SHELF							NOTE 4
T1		COPIER	KNOICA-M	458e	24"	27"	39"		NOTE 1
W1		PALLET JACK	DAYTON	2LEB9	29"	74"	55"		NOTE 1
		CHARGER	DAYTON	MH2LEB908					NOTE 1
W2		REACH TRUCK	TOYOTA	9BRU18	61"	112"			NOTE 1
		CHARGER	TBD						

NOTE 1 SEE ELECTRICAL FOR SERVICE REQUIREMENTS.
NOTE 2 TYPE 1 - SINGLE, FREESTANDING HIGH PILE PALLET RACK SYSTEM
NOTE 3 TYPE 2 - SINGLE, BACK TO BACK HIGH PILE PALLET RACK SYSTEM.
NOTE 4 PROVIDED AND INSTALLED BY OWNER.



SINGLE, FREESTANDING PALLET RACK SYSTEM
TYPE '1'

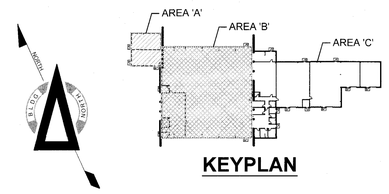


SINGLE, BACK TO BACK PALLET RACK SYSTEM
TYPE '2'

PALLET NOTES:

PN1. PALLET STOPS AT EACH PALLET POSITION; 2 AT 6'-0" RACKS, 2 AT 8'-0" RACKS, 3 AT 12'-0" RACKS.
PN2. SEE STRUCTURAL GENERAL NOTES 11 FOR ADDITIONAL REQUIREMENTS.
PN3. PROVIDE LOAD PLAQUES AT ENDS OF AISLES, MIN., TYP.

3 A-1-700 **HIGH PILE PALLET RACK SYSTEM DETAILS**
SCALE: 1/8"=1'-0"



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group, a division of GRW
AIRPORT PLANNING / DEVELOPMENT
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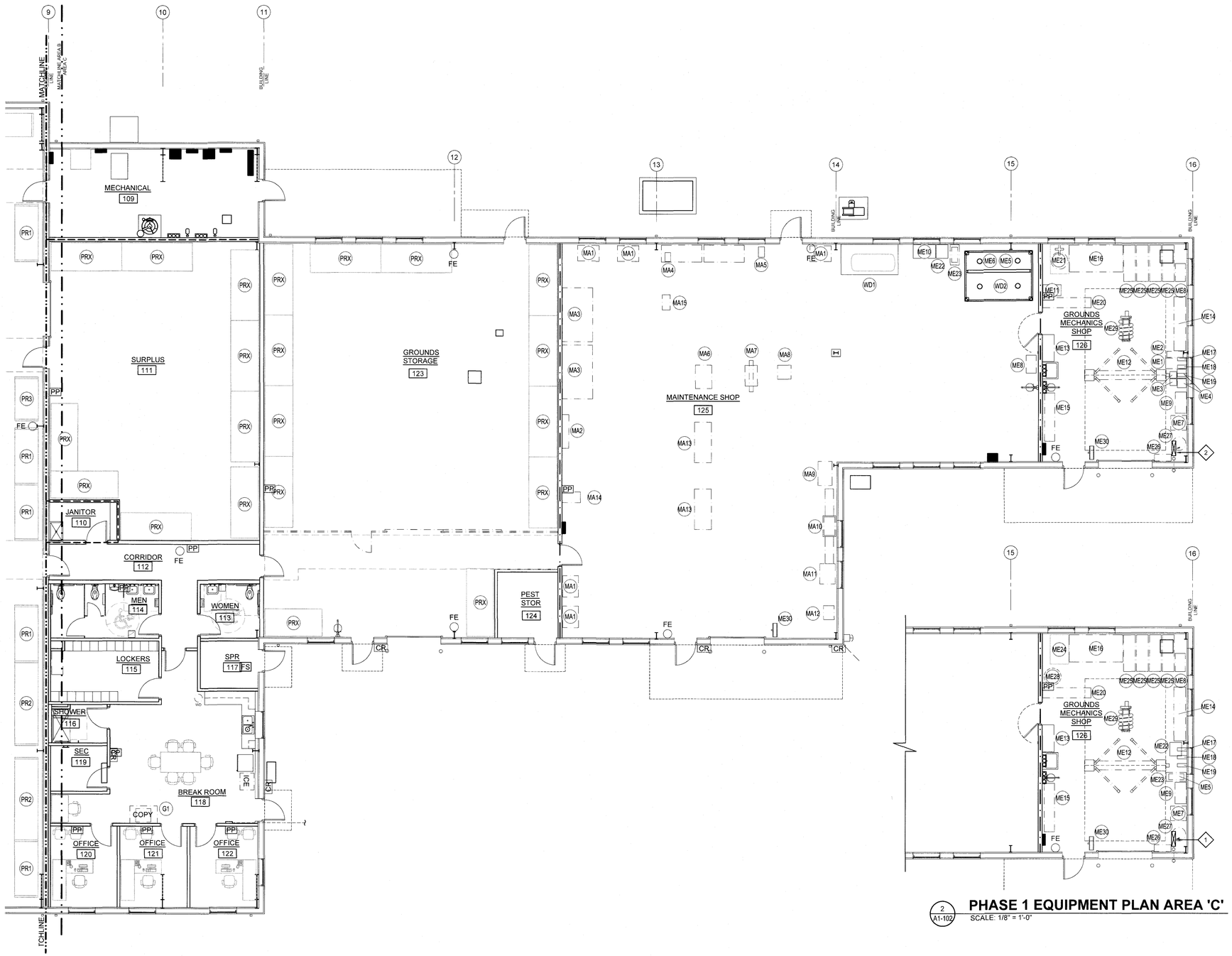
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
FLOOR PLAN AREA 'A' AND 'B'
EQUIPMENT LAYOUT AND SCHEDULE

SEAL OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 3821 REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
DESIGNED BY:	PAW
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EQUIPMENT SCHEDULE

ITEM	PROVIDE/ INSTALL	DESCRIPTION	MFG	MODEL	WIDTH	LENGTH	HEIGHT	WEIGHT	COMMENT
WD1		AIR COMPRESS							NOTE 1
WD2		WELD TABLE							
G1	OPOI	COPIER	KONICA-M	458e	24"	27"	39"	212	NOTE 1
BR1	OPOI	ICE MACHINE	SCOTSMAN		25"	30"	40"		NOTE 1
MA1		CABINET							
MA2		PANEL SAW	MILWAUKEE	6480		60"	70"		NOTE 1
MA3		PLYWOOD RACK			4'6	8'	8'		
MA4		VISE	WILTON	21800 746A	10"	16"	10"		
MA5		DRILL PRESS	JET	J-2530	11"	18.5"			NOTE 1
MA6		TABLE SAW	JET	JTAS-10XL-DX	29"	42"	34"		NOTE 1
MA7		JOINTER	JET	JJ-6CSDX		56"	31"		NOTE 1
MA8		PLANER/MOLDER	JET	JPM-13CS	24"	25"	41"		NOTE 1
MA9		SHAPER	JET	JWS-25X	25"	43"	23"	381	NOTE 1
		MOBILE BASE	JET	JMB-JWS	24"	24"			NOTE 1
MA10		MITER SAW	DEWALT	DWS779	19"	33"	20"	56	NOTE 1
		SAW STATION	O.S.	040039-50	24"	11'1			NOTE 1
MA11		RADIAL ARM SAW	DAYTON	499F78	27.5"	35.5"		398	NOTE 1
MA12		FINISHER	JET	J-4200A	19"	25	57.5		NOTE 1
MA13		WORK BENCH	GLOBAL	WB3189I3BK	30"	72"	29-37"		
MA14		BAND SAW	JET	714400K	17"	33"			NOTE 1
MA15		DUST COLLECTOR	JET	DC-650BK	14"	27"	66"	62	NOTE 1
ME1	OPOI	JOIST/CHERRY PICK	PWR FORGE	3582	19"	37"	57"	200	
ME2	OPOI	FLOOR JACKS			11"	26"	48"	60	
ME3	OPOI	JACK STANDS			12"	12"	18"	50	
ME4	OPOI	TALL JACK STANDS			18"	18"	24"	30	
ME5	OPOI	MIG WELDER	MILLER	140					NOTE 4
ME6	OPOI	PLASMA CUTTER	ARC WELD	CUT45T	4"	10"	16"	25"	
ME7		20T SHOP PRESS			26"	28"	70"		
ME8	OPOI	DRILL PRESS			32"	18"	67"		
ME9	OPOI	20G PARTS WASH			20"	38"	33"		
ME10	OPOI	BLAST CABINET	DER BLAST	L6	24"	40"	67"	300	
ME11	OPOI	LIFT TABLE							
ME12	CC	GOLF CART LIFT	GOLF-LIFT	GL-9	139"	120"	112"		
ME13	OPOI	FIRE CABINET			21"	48"	70"		
ME14	OPOI	BOLT BIN			21"	96"	70"		
ME15	OPOI	TOOL BOX			18"	86"	63"		
ME16	OPOI	SECURE CAGE			48"	96"	96"		
ME17	OPOI	AIR REEL	DYNA FLOW	5650A	7"	18"	12.5"	35	
ME18	OPOI	POWER REEL	DYNA FLOW	5650E	7"	18"	12.5"	35	
ME19	OPOI	WORK LIGHT REEL	DYNA FLOW	5650L	7"	18"	12.5"	35	
ME20	OPOI	TALL WORKBENCH			30"	60"	36"		
ME21	OPOI	TIRE CHANGER							
ME22	OPOI	OXY/ACT TORCH/CART			21"	24"	52"		
ME23	OPOI	WELDING CART			16"	36"	52"		NOTE 4
ME24	OPOI	AIR COMPRESSOR			33"	52"	76"		NOTE 1, 3
ME25	OPOI	FILE/PARTS CABINET			21"	65"	60"		
ME26	OPOI	PEDISTAL TOOLS							NOTE 5
ME27	OPOI	TOOL PEDISTAL			12"	12"	40"	40"	
ME28	CC	WATER HEATER			30" DIA		76"		NOTE 1,2
ME29	CC	VEHICLE EXHAUST FAN							
ME30	CC	WATER HOSE REEL	REELCRAFT	83000 OLP	3/4x50'				DET 3/P-501
PRX		EXIST. PALLET RACK							NOTE 6

OPOI - OWNER PROVIDED / OWNER INSTALLED - CONTRACTOR TO COORDINATE AND PROVIDE POWER RECEPTICLES, ROUGH-INS FOR HARDWIRED EQUIPMENT AND OTHER UTILITY AND STRUCTURAL REQUIREMENTS FOR OWNER INSTALLATION AND USE.
OPC - OWNER PROVIDED / CONTRACTOR INSTALLED
CC - CONTRACTOR PROVIDED / CONTRACTOR INSTALLED

NOTES :
NOTE 1 - SEE ELECTRICAL FOR SERVICE REQUIREMENTS
NOTE 2 - PROVIDE WATER HEATER IN THIS LOCATION FOR WATER HEATER FOR PHASE 1. MOVE WATER HEATER TO MECHANICAL ROOM IN PHASE 2.
NOTE 3 - USE EXISTING AIR COMPRESSOR FOR PHASE 1. PROVIDE AND CONNECT AIR COMPRESSOR WD1 IN PHASE 2.
NOTE 4 - ME 5 SITS ON WELDING CART ME 23
NOTE 5 - PEDISTAL TOOLS INCLUDE A VISE, BENCH GRINDER, CHAINSAW SHARPENER, PIPE VISE, 50LB ANVIL, AND BELT/DISK SANDER.
NOTE 6 - PROVIDED AND INSTALLED BY: OWNER

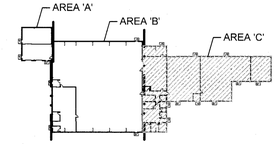
CONSTRUCTION NOTES

1. INSTALL BACKFLOW PREVENTER VERTICALLY FOR TEMPORARY USE IN PHASE 1.
2. REMOVE BACKFLOW PREVENTER. INSTALL BACKFLOW PREVENTER IN FINAL LOCATION PER PLUMBING DRAWINGS, AND CAP LINE.

2 A1-102 **PHASE 1 EQUIPMENT PLAN AREA 'C'**
SCALE: 1/8" = 1'-0"

1 A1-102 **EQUIPMENT PLAN AREA 'C'**
SCALE: 1/8" = 1'-0"

0' 4' 8' 16' 24'
SCALE: 1" = 8'



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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AIRPORT PLANNING / DEVELOPMENT
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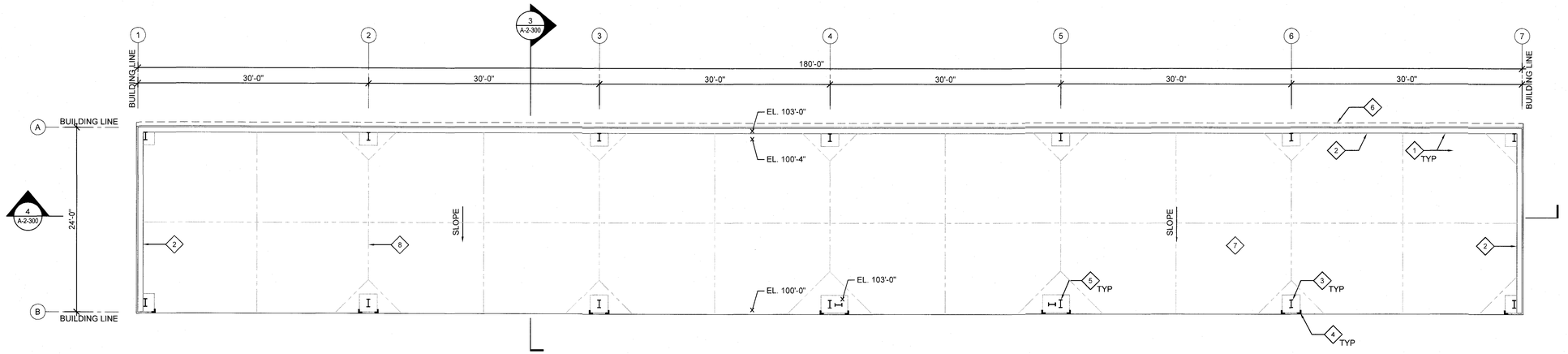
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
FLOOR PLAN AREA 'C'
EQUIPMENT LAYOUT AND SCHEDULE

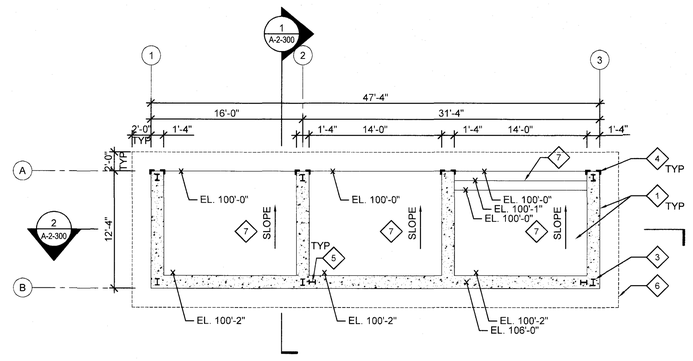
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 3521
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	DND
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A-1-701	

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1 A-2-100 **OPEN STORAGE PLAN**
SCALE: 1/8" = 1'-0"



2 A-2-100 **OPEN BULK STORAGE PLAN**
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

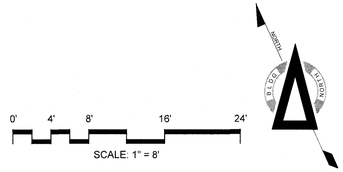
1. PROVIDE SEALED CONCRETE FOR ALL EXPOSED CONCRETE SURFACES OF BUILDING, INCLUDING FLOORS, PIERS, WALLS/CURBS AND TOPS OF WALLS/CURBS AND PIERS.
2. WALL LINER PANELS.
3. PAINT ALL "NON-PREFINISHED" STEEL, INCLUDING BUT NOT LIMITED TO COLUMNS, BEARING PLATES, BOLTS, WELDS, JOISTS, BEAMS, ETC. ALSO PAINT BOTTOMS OF BEARING PLATES AND HOLES PRIOR TO INSTALLATION.
4. STEEL CORNER GUARDS CAST IN CONCRETE.
5. PAINTED STEEL COLUMNS AND BEARING PLATES.
6. OVERHANG, SEE ROOF PLAN.
7. CONCRETE SLAB, SEE STRUCTURAL.
8. JOINT SEALANT IN CONCRETE JOINTS, SEE STRUCTURAL.
9. SALT CONTAINMENT LIP

OPEN STORAGE AND OPEN BULK STORAGE BUILDING SYSTEM EFFICIENCY REQUIREMENTS

BUILDING 2 - OPEN STORAGE AND OPEN BULK STORAGE BUILDINGS

PROVIDE THERMAL EFFICIENCY OF BUILDING SYSTEM PER ANSI/ASHRAE 90.1-2010, CLIMATE ZONE 4A INCLUDING THE FOLLOWING:

WALL INSULATION-	NONE
ROOF INSULATION-	NONE
WINDOWS-	NONE
DOORS-	NONE
OVERHEAD DOORS-	NONE



SCALE: 1" = 8'

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PROJECT INFORMATION
West Virginia Department of Administration
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Capitol East Campus
Charleston, West Virginia

OPEN STORAGE AND BULK STORAGE SCHEMATIC PLAN

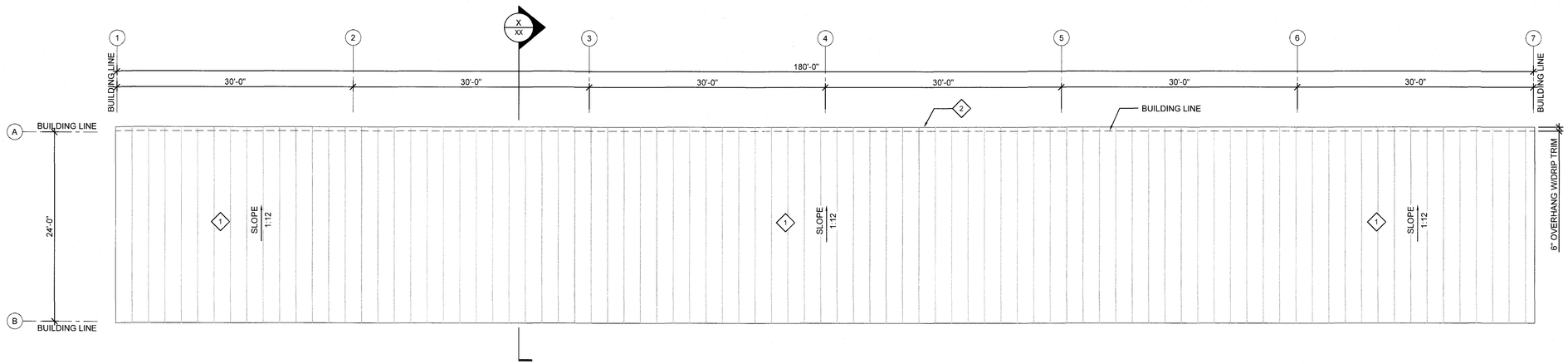
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 9521
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
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REVISION	

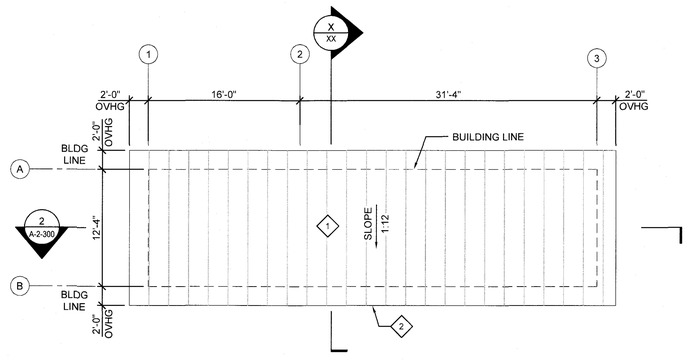
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CONSTRUCTION NOTES

1. STANDING SEAM ROOF SYSTEM.
2. PROVIDE DRIPEDGE AND EAVE TRIM, NO GUTTERS.



1 / A-2-100 **OPEN STORAGE ROOF PLAN**
SCALE: 1/8" = 1'-0"



2 / A-2-100 **OPEN BULK STORAGE ROOF PLAN**
SCALE: 1/8" = 1'-0"

0' 4' 8' 16' 24'
SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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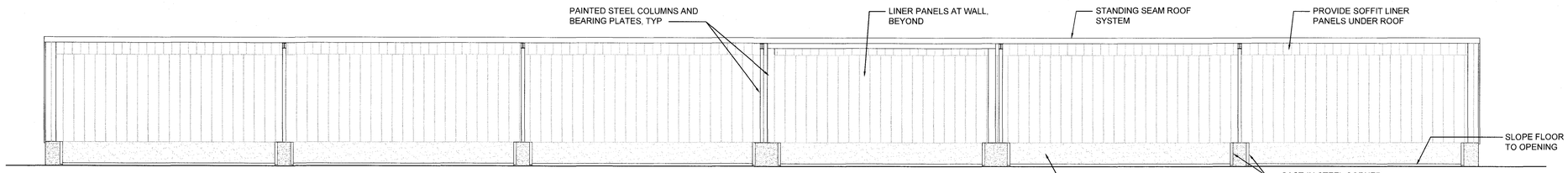
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

OPEN STORAGE AND BULK STORAGE ROOF PLANS

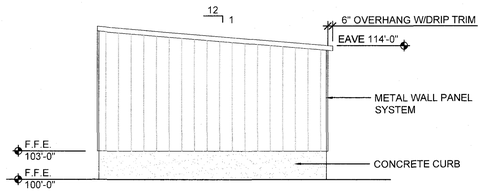
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 36381
REGISTERED ARCHITECT
8/6/2021

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A-2-101	△

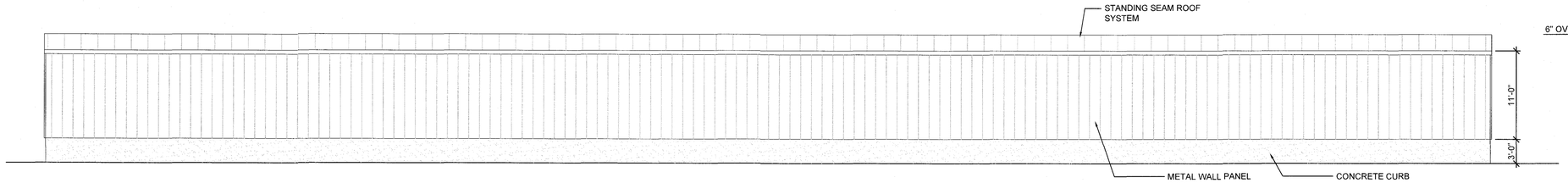
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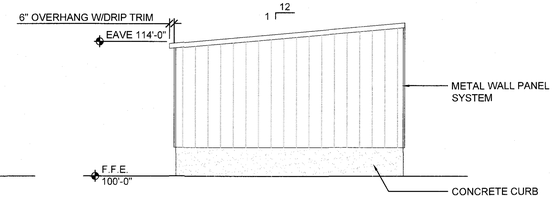
1 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



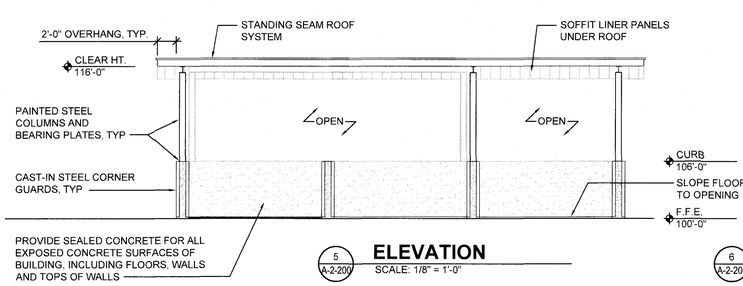
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SCALE: 1/8" = 1'-0"



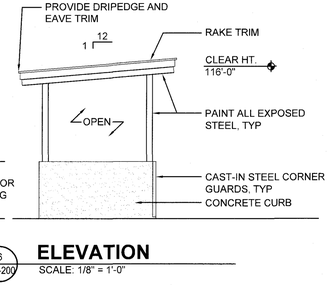
3 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



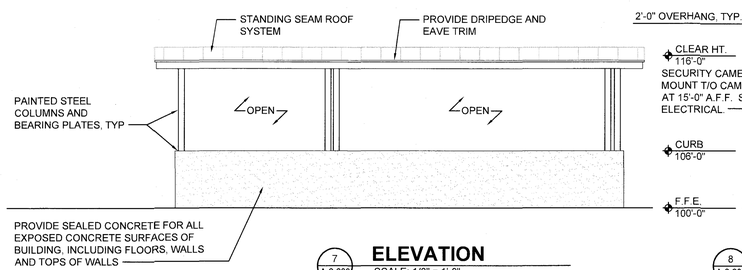
4 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



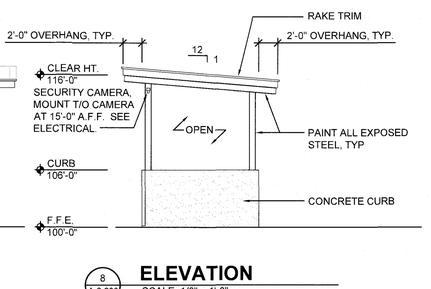
5 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



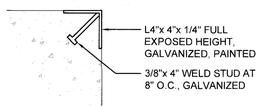
6 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



7 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



8 A-2-200 **ELEVATION**
SCALE: 1/8" = 1'-0"



9 A-2-200 **CORNER GUARD DETAIL**
SCALE: 1 1/2"=1'-0"

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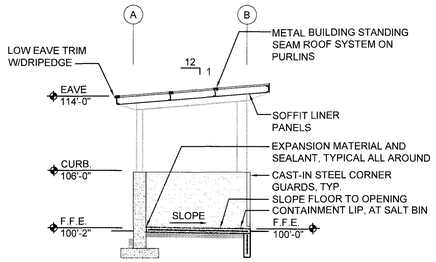
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

OPEN STORAGE AND BULK STORAGE ELEVATIONS

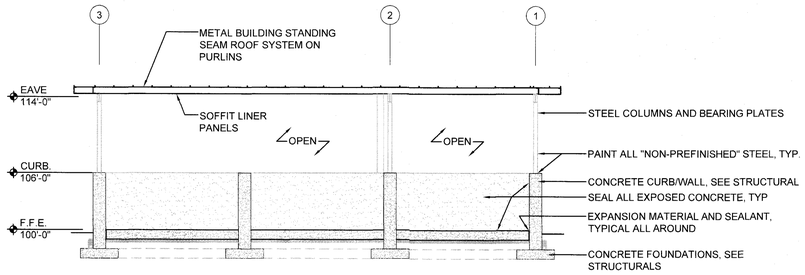
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
AND ASSOCIATES
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
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A-2-200	

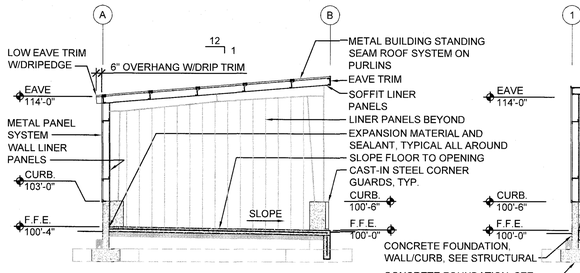
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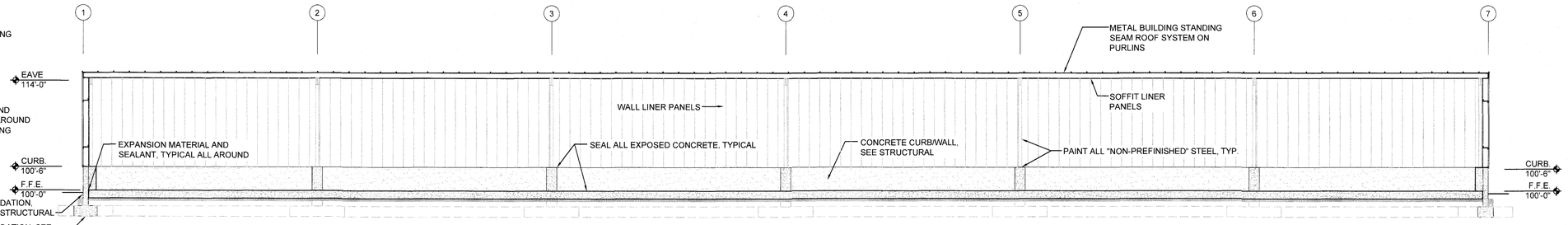
1 A-2-300 **SECTION**
SCALE: 1/8" = 1'-0"



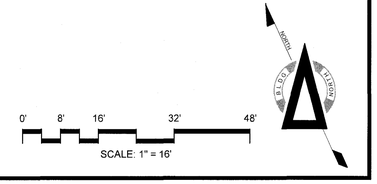
2 A-2-300 **SECTION**
SCALE: 1/8" = 1'-0"



3 A-2-300 **SECTION**
SCALE: 1/8" = 1'-0"



4 A-2-300 **SECTION**
SCALE: 1/8" = 1'-0"



SCALE: 1" = 16'

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Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE/GROUNDS BUILDING
BUILDING AND WALL SECTIONS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARHOOK
No. 14124
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
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A-2-300	

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ABBREVIATIONS

A	
A.C.	AIR CONDITIONED
ACOUST	ACOUSTIC TILE CEILING
ACOUST./P	ACOUSTIC WALL PANEL
ACOUST./S	ACOUSTIC TEXTURED SPRAY FINISH
A.D.	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
ADDIT.	ADDITIONAL
A.H.U.	AIR HANDLING UNIT
ALT	ALTERNATE
ALUM.	ALUMINUM
AMP. / A.	AMPERES
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX.	APPROXIMATELY
A.O.	ACCESS OPENING
ARCH.	ARCHITECTURAL
ARGB	ABUSE-RESISTANT GYP. BD.
A.T.	ASPHALT TILE
AV	AUDIO VISUAL
B	
BAL.	BALANCE
BD.	BOARD
BLDG.	BUILDING
BLK.	BLANK
BM.	BEAM
BOT.	BOTTOM
B.O.	BOTTOM OF
BRG.	BEARING
B.T.U.H.	BRITISH THERMO UNIT/HOUR
C	
℄	CENTER LINE
CAB.	CABINET
CAP.	CAPACITY
CARPT	CARPET
C/B	CIRCUIT BREAKER
C.D.	CEILING DIFFUSER
CEM.	CEMENT
CER.	CERAMIC
C.F.M.	CUBIC FEET/MINUTE
CIRC.	CIRCULATING
C.J.	CONTROL JOINT
CKT.	CIRCUIT
CL.	CLOSET
CLG.	CEILING
CMD.	CORRUGATED METAL DECKING
C.M.U.	CONCRETE MASONRY UNIT
C.O.	CLEAN OUT
COL.	COLUMN
CONC.	CONCRETE
COND.	CONDENSATE
CONN.	CONNECTION
CONST.	CONSTRUCTION
CONT.	CONTINUOUS
CONTR. J.	CONTRACTION JOINT
COORD.	COORDINATE
CT	CERAMIC TILE
CTB	CERAMIC TILE BASE
D	
DEMO	DEMOLISH / DEMOLITION
DET.	DETAIL
DF.	DRINKING FOUNTAIN
DIA.	DIAMETER
DIFF.	DIFFUSER
DIM.	DIMENSION
DISC.	DISCONNECT
D.J.	DUMMY JOINT
DN.	DOWN
DR.	DRAIN
D.S.	DOWN SPOUT
DWG.(S)	DRAWING(S)
E	
EA.	EACH
E.C.	EMPTY CONDUIT
E.F.	EXHAUST FAN
E.J.	EXPANSION JOINT
ELEC.	ELECTRIC
ELEV.	ELEVATION
ENG.	ENGINEER
EP.	EPOXY PAINT
EQUIP.	EQUIPMENT
E.W.C.	ELECTRIC WATER COOLER
EXH.	EXHAUST
EXT.	EXTERIOR
EXIST.	EXISTING
F	
F.A.	FIRE ALARM
F.C.	FLEXIBLE CONNECTION
F.D.	FLOOR DRAIN
F.E.C.	FIRE EXTINGUISHER CABINET
F.F.E.	FINISH FLOOR ELEVATION
F.O.	FACE OF
FIN.	FINISH
FLR.	FLOOR
FT.	FOOT, FEET
FTG.	FOOTING
F.V.	FIELD VERIFY
G	
GA.	GAGE
GAL.	GALLON
GALV.	GALVANIZED
GEN.	GENERAL
GL.	GLASS
GLAZ.	GLAZING
GND.	GROUND
G.P.H.	GALLONS/HOUR
G.P.M.	GALLONS/MINUTE
G.W.B.	GYPSUM WALL BOARD
GYP.	GYPSUM
H	
H.	HIGH
H.&V.	HEATING AND VENTILATING
H.B.	HOSE BIBB
H.C.	HOLLOW CORE
HDWR.	HARDWARE
HGHT.	HEIGHT
H.M.	HOLLOW METAL
H.P.	HORSE POWER
HR.	HOUR
HTR.	HEATER
HTG.	HEATING
HYD.	HYDRANT
I	
I.D.	INSIDE DIAMETER
I.E.	INVERT ELEVATION
IN.	INCHES
INCAND.	INCANDESCENT
INSUL.	INSULATION
INT.	INTERIOR
INTL.	INTERNATIONAL
J	
JAN.	JANITOR
J.B.	JUNCTION BOX
JCT.	JUNCTION
JT.	JOINT
K	
KVA	KILOVOLT AMPERE
KW	KILOWATT
L	
L	LONG
LAV.	LAVATORY
LB. / #	POUND
L.P.	LIGHTING PANEL
LTG.	LIGHTING
M	
MAINT.	MAINTENANCE
MAX.	MAXIMUM
M.D.P.	MAIN DISTRIBUTION PANEL
MECH.	MECHANICAL
MIN.	MINIMUM
MISC.	MISCELLANEOUS
M.O.	MASONRY OPENING
MRGB	MOISTURE-RESISTANT GYP.BD.
M.T.	METAL THRESHOLD
MTD.	MOUNTED
MTG.	MOUNTING
MTL.	METAL
M.V.	MECHANICAL VENTILATION
M.G.T.	MATT GLAZE TILE
N	
N.A., N/A	NOT APPLICABLE
N.I.C.	NOT IN CONTRACT
NO.	NUMBER
O	
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
OH.	OVERHEAD
OPNG.	OPENING
OPP.	OPPOSITE
O.S.D.	OPEN SIGHT DRAIN
P	
P.	PAINT
PART.	PARTITION
PER.	PERIMETER
P.I.	POINT OF INTERSECTION
PL.	PLATE
PLBG.	PLUMBING
PLY. WD.	PLYWOOD
PNL.	PANEL
P.O.T.	POINT ON TANGENT
PRE	PREFINISHED
PRESS.	PRESSURE
PRB	PROFILED RUBBER BASE
PSF	POUNDS/SQUARE FOOT
PSI	POUNDS/SQUARE INCH
PT.	POINT
PWD	PRE-ENGINEERED WOOD
Q	
QT	QUARRY TILE
QTB	QUARRY TILE BASE
QTR.	QUARTER
QUAN.	QUANTITY
R	
R	RISER
R.A.	RETURN AIR
RAD.	RADIUS
RB	RUBBER COVE BASE
RD.	ROUND
REC'D.	RECOMMENDED
RECIRC.	RECIRCULATING
RECP.	RECEPTACLE
REG.	REGISTER
REINF.	REINFORCING
REQ.	REQUIRED
R (CONT.'D)	
RET.	RETURN
R.G.	RETURN GRILLE
RM.	ROOM
R.P.M.	REVOLUTION/MINUTE
S	
S	SUPPLY
SCH.	SCHEDULE
SECT.	SECTION
SERV.	SERVICE
SHT.	SHEET
S.J.	SLIP JOINT
SPEC.	SPECIFICATIONS
SQ. FT., S	SQUARE FEET
ST.	STAIN
STOR.	STORAGE
STRUCT.	STRUCTURAL
SUSP.	SUSPENDED
SV	SHEET VINYL
T	
T	THICK/THICKNESS
TEL.	TELEPHONE
TEMP.	TEMPERATURE
THRESH.	THRESHOLD
T.O.	TOP OF
TYP.	TYPICAL
U	
URIN.	URINAL
UTIL.	UTILITY
V	
V.	VOLT
VCT	VINYL COMPOSITION TILE
VENT.	VENTILATION
VERT.	VERTICAL
W	
W.	WATT
W/	WITH
W.C.	WATER CLOSET
WD	WOOD
WF	WIDE FLANGE
W.W.F.	WELDED WIRE FABRIC

ARCHITECTURAL SYMBOL KEY:

- REVISIONS SCHEDULE TAG (#)
- KEYNOTE SCHEDULE TAG (#)
- EQUIPMENT SCHEDULE TAG (000)
- WINDOW SCHEDULE TAG (#)
- DOOR SCHEDULE TAG (#)
- CASEWORK TAG (#)
- WALL SCHEDULE TAG (#)
- COLUMN LINE TAG (#)
- ELEVATION TAG (F.F.E. / EL. ###)
- SPOT ELEVATION TAG (0000)
- MATCH LINE — SEE XX/X-XXX
- PLAN NORTH — NORTH ARROW
- DETAIL INDICATOR W/ AREA (# / 0-0-000; Detail number; Sheet where detail is drawn)
- INTERIOR ELEVATION TAG (# / 0-0-000; Elevation number; Sheet where elevation is drawn)
- MULTIPLE INTERIOR ELEVATION TAG (A, B, C, D; Multiple elevation number; Sheet where elevation is drawn)
- EXTERIOR ELEVATION TAG (# / 0-0-000; Exterior elevation number; Sheet where elevation is drawn)
- SECTION CUT TAG (# / 0-0-000; Section cut number; Sheet where section is drawn)

MATERIAL INDICATIONS

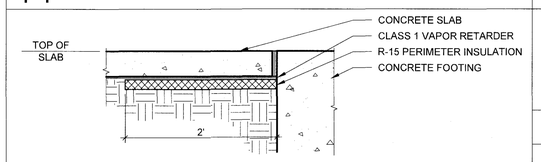
- EARTH
- CRUSHED STONE
- STRUCTURAL CONCRETE
- GROUT, PLASTER OR SAND
- CONCRETE MASONRY UNITS
- STEEL (CROSS SECTION)
- INSULATION (RIGID)
- INSULATION (BATT)
- WOOD (BLOCKING)
- WOOD (FINISHED)

GENERAL ARCHITECTURAL NOTES:

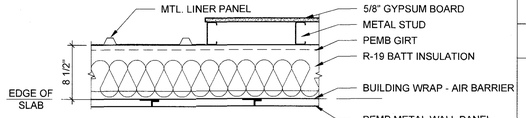
1. DIMENSIONS THAT ARE NOT STATED AS "MAXIMUM" OR "MINIMUM" ARE ABSOLUTE.
2. CONTRACTOR SHALL NOT SCALE DRAWINGS FOR DIMENSIONAL USE. USE ONLY WRITTEN DIMENSIONS.
3. CONTRACTOR SHALL INSTALL ALL BUILDING COMPONENTS WITHIN CURRENT DIMENSIONAL REQUIREMENTS OF THE ADA ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES.
4. ALL EQUIPMENT SHOWN IN THE DRAWINGS IS TO BE CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED "NIC".
5. ALL WALL TYPES TO REFERENCE THE ARCHITECTURAL WALL TYPES SCHEDULE UNLESS OTHERWISE NOTED.
6. CONTRACTOR AND SUB-CONTRACTORS TO VERIFY ALL DIMENSIONS IN THE FIELD PRIOR TO BEGINNING CONSTRUCTION OR ORDERING MATERIALS. INQUIRIES AND DISCREPANCIES SHOULD BE DIRECTED TO THE DESIGNER OF RECORD.
7. ALL ROOM NUMBERS ARE FOR CONSTRUCTION PURPOSES ONLY.
8. CONTRACTOR SHALL PROVIDE STIFFENERS, BRACING, BACKING PLATES, SUPPORTING BRACKETS, ETC. REQ'D FOR ANY WALL-MOUNTED CABINETS OR EQUIPMENT.
9. PROPERLY SEAL ALL CONDUITS, PIPES, DUCTS & OTHER ITEMS OR SYSTEMS THAT PENETRATE FIRE-RATED PARTITIONS, WALLS, AND FLOORS. PROVIDE CLASSIFIED SEALANT SYSTEMS PER SPECIFICATIONS.
10. PROVIDE CONTROL JOINTS IN GYPSUM BOARD IN GYPSUM BOARD AT MAXIMUM DISTANCE OF 30 LINEAR FEET FOR VERTICAL SURFACES AND 50 LINEAR FEET OR 2,500 SQ. FT. FOR CEILINGS. REFER TO REFLECTED CEILING PLANS AND WALL ELEVATIONS FOR SPECIFIC LOCATIONS.
11. THERE SHALL BE NO EXPOSED PIPE, CONDUITS, DUCTS, VENTS, ETC. IN DESIGNATED FINISH SPACES, UNLESS NOTED AS EXPOSED CONSTRUCTION ON FINISH SCHEDULE.
12. THE CONTRACTOR SHALL COORDINATE SIZE AND LOCATION OF HVAC,PLUMBING, ELECTRICAL, AND TECHNOLOGY ITEMS AND OPENINGS PRIOR TO PROCEEDING WITH RELATED WORK.
13. PROVIDE ACCESS PANELS AS REQUIRED BY APPLICABLE CODES AND AS REQUIRED FOR MECHANICAL EQUIPMENT. ACCESS PANELS LOCATED IN FINISH AREAS SHALL BE PAINTED OR PRE-FINISHED TO MATCH ADJACENT SURFACES.
14. UNLESS SHOWN OTHERWISE, DOOR LOCATIONS NOT LOCATED BY DIMENSIONS SHALL BE CENTERED IN WALL OR BE LOCATED FOUR INCHES (4") FROM FINISHED PERPENDICULAR WALL TO OUTSIDE EDGE OF DOOR FRAME.
15. DETAILS NOT SHOWN ARE SIMILAR IN CHARACTER TO THOSE SHOWN. WHERE SPECIFIC DIMENSIONS, DETAILS, OR DESIGN INTENT CANNOT BE DETERMINED, CONSULT THE DESIGNER OF RECORD PRIOR TO PROCEEDING WITH WORK.
16. SEPARATE ALL DISSIMILAR METALS TO PREVENT CORROSION CAUSE BY ELECTROLYSIS ACTION OR OTHER CAUSES AS RECOMMENDED BY THE RESPECTIVE PRODUCT MANUFACTURER OR SUPPLIER.
17. PAINT ALL EXPOSED ELECTRICAL CONDUIT, ELECTRICAL RACEWAYS AND BOXES, MECHANICAL PIPING, DUCTS, EQUIPMENT, AND PLUMBING PIPING WITH THE EXCEPTION OF PREFINISHED AND INSULATED ITEMS.
18. CONTRACTOR SHALL COMPLY WITH ALL LAWS, ORDINANCES, RULES, AND REGULATIONS OF FEDERAL, STATE, REGIONAL, AND LOCAL AUTHORITIES REGARDING HANDLING, STORING, TRANSPORTING, AND DISPOSING OF HAZARDOUS MATERIALS. IF THE CONTRACTOR ENCOUNTERS MATERIALS WHICH HAVE NOT BEEN REMOVED OR RENDERED HARMLESS, THEY SHALL STOP WORK IN THE AREA AFFECTED AND REPORT THE CONDITION TO THE CONTRACTING OFFICERS REPRESENTATIVE AND PROPER AUTHORITIES IN WRITING.

WALL TYPES

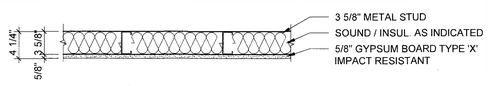
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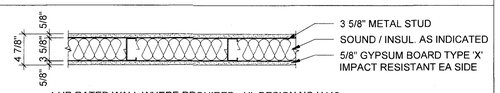
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I1

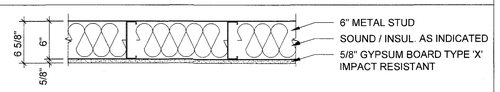


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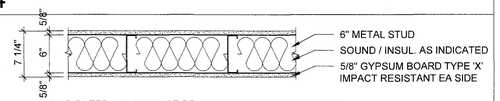


1 HR RATED WALL WHERE REQUIRED - UL DESIGN NO.U419

I3



I4



1 HR RATED WALL WHERE REQUIRED - UL DESIGN NO.U465

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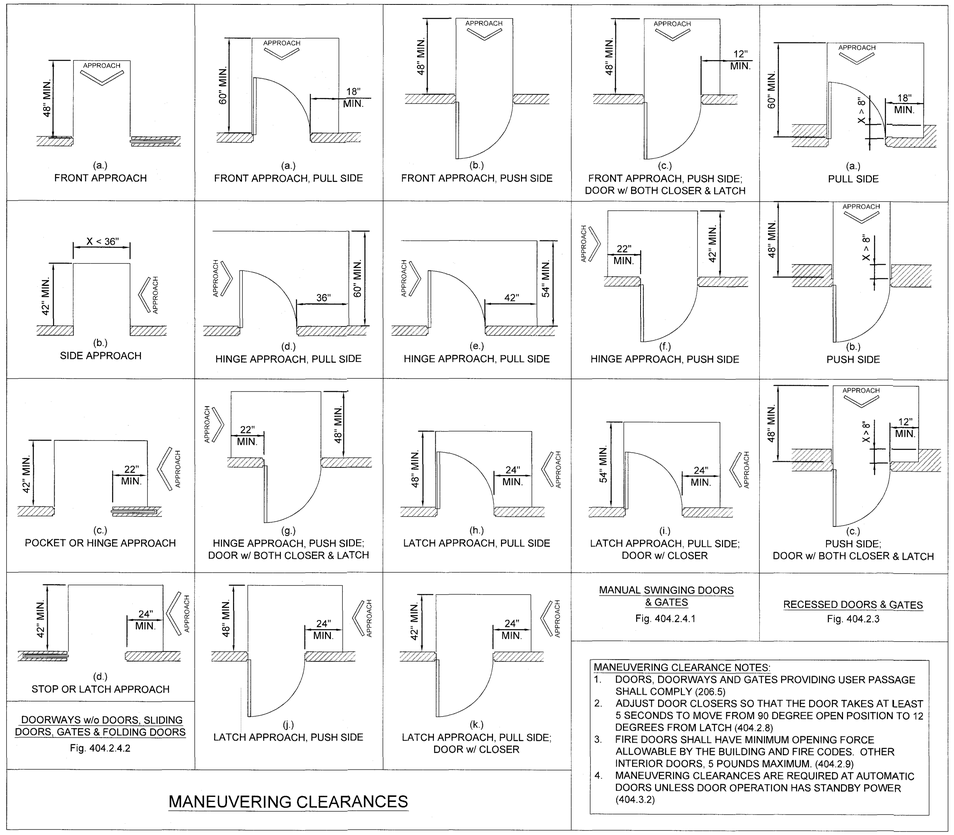
CAPITOL MAIL ROOM
ALTERNATE 1

ARCHITECTURAL GENERAL NOTES AND WALL TYPES

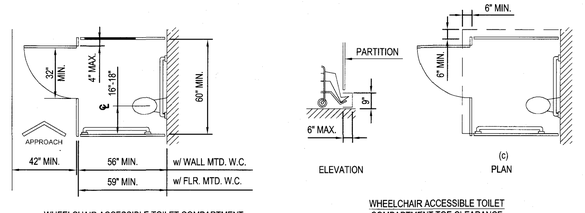
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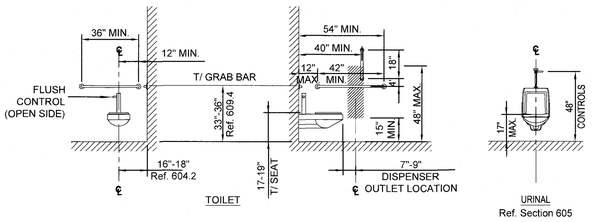
JOB NUMBER:	19027
SCALE:	NTS
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-3-001
REVISION	△

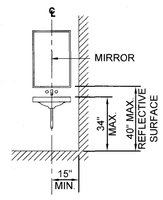
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MANEUVERING CLEARANCES



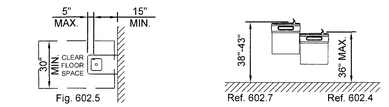




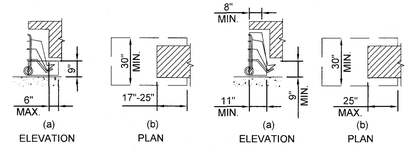
TOILET ROOM NOTES:
1. A TURNING SPACE PER SECTION 304 IS REQUIRED WITHIN A TOILET ROOM (603.2.1)
2. ONLY THE FOLLOWING OBJECTS ARE PERMITTED TO OVERLAP THE REQUIRED CLEARANCE: GRAB BARS, DISPENSERS, SANITARY NAPKIN DISPOSAL UNIT, COAT HOOKS AND SHELVES (604.3.2)
3. FLUSH CONTROLS SHALL BE LOCATED ON THE OPEN SIDE OF THE WATER CLOSET (604.6)
4. URINALS SHALL HAVE A CLEAR FLOOR SPACE COMPLYING WITH 305 POSITIONED FOR FORWARD APPROACH AND CENTERED ON UNIT (605.3)
5. LAVATORIES SHALL HAVE A CLEAR FLOOR SPACE COMPLYING WITH 305 POSITIONED FOR FORWARD APPROACH AND CENTERED ON UNIT (606.2)
6. KNEE & TOE CLEARANCE COMPLYING WITH 306 SHALL BE PROVIDED (602.2)
7. EXPOSED WATER SUPPLY AND DRAIN PIPES SHALL BE INSULATED. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES UNDER LAVATORIES (606.5)
8. INSTALL GRAB BARS TO WITHSTAND NOT LESS THAN A 250 POUND FORCE APPLIED AT ANY POINT ON THE BAR (609.8)

TOILET ROOM CLEARANCES & MOUNTING HEIGHTS
Ref. Chapter 6

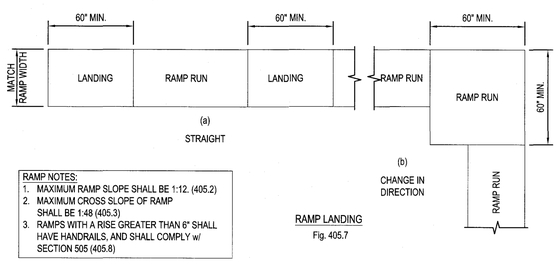
DRINKING FOUNTAIN NOTES:
1. KNEE & TOE CLEARANCE COMPLYING WITH 306 SHALL BE PROVIDED (602.2)
2. WHERE A DRINKING FOUNTAIN IS REQUIRED, TWO SHALL BE PROVIDED; ONE HIGH & ONE LOW (211.2)
3. UNITS SHALL HAVE A CLEAR FLOOR SPACE COMPLYING WITH 305 POSITIONED FOR FORWARD APPROACH AND CENTERED ON UNIT (602.2)



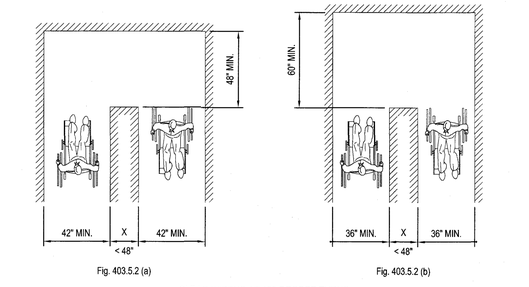
DRINKING FOUNTAIN
Ref. Section 602



KNEE & TOE CLEARANCES
Ref. Section 306



RAMPS
Ref. Section 405



ACCESSIBLE ROUTE
Ref. Section 402

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CAPITOL MAIL ROOM
ALTERNATE 1

GENERAL ACCESSIBILITY DETAILS

SEAL: STATE OF WEST VIRGINIA, PHILLIP ALAN WARNOCK, NO. 3521, REGISTERED ARCHITECT, 8/6/2021

JOB NUMBER:	19027
SCALE:	NTS
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
A-3-002	△

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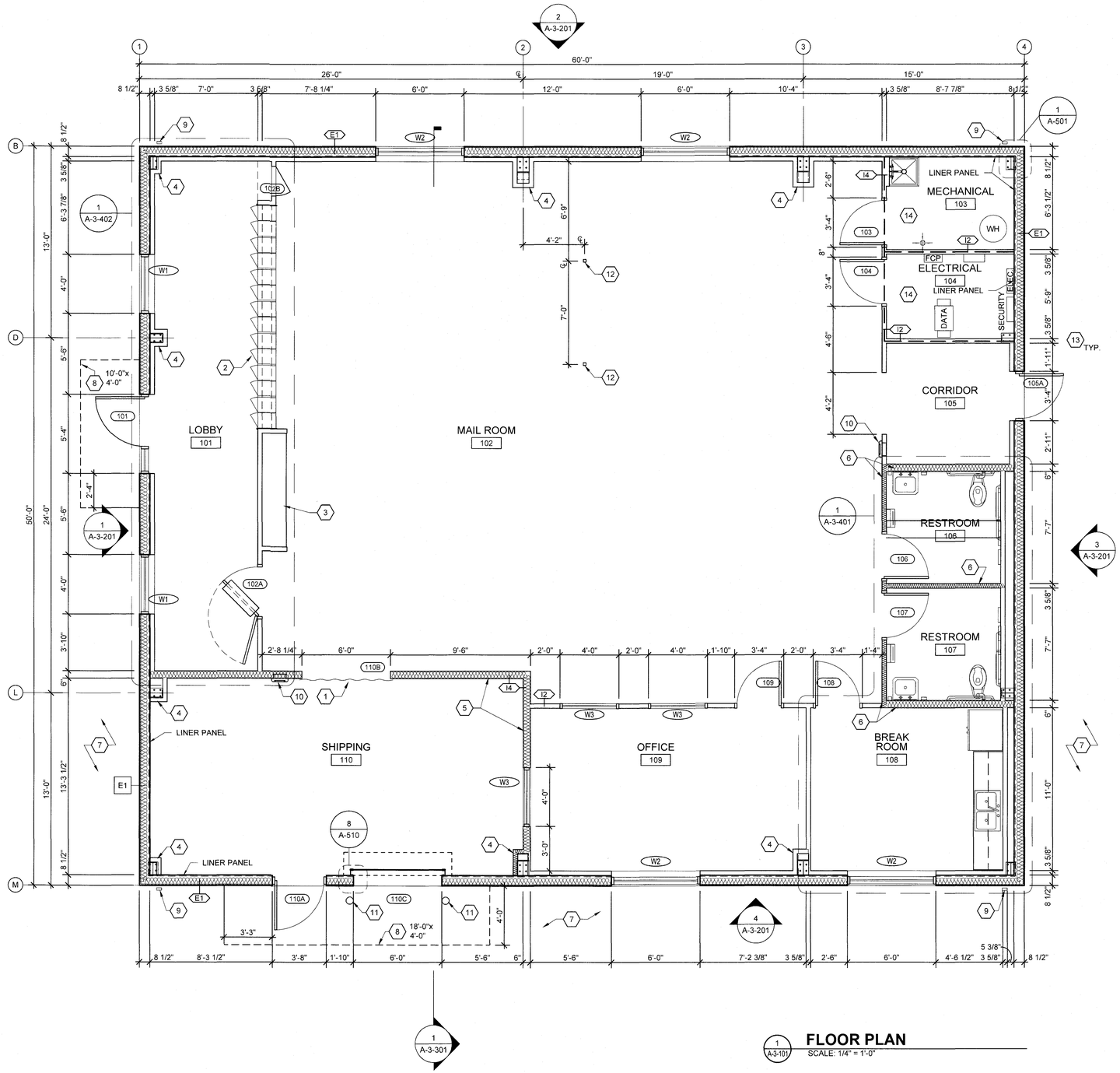
BUILDING SYSTEM EFFICIENCY REQUIREMENTS

PROVIDE THERMAL EFFICIENCY OF BUILDING SYSTEM PER ANSI/ASHRAE 90.1-2010, CLIMATE ZONE 4A INCLUDING THE FOLLOWING:

SLAB INSULATION -	2 FOOT OF R-15 PERIMETER INSULATION AT SLAB
WALL INSULATION -	ASSEMBLY MAX U-0.084 OR R-19 INSULATION
ROOF INSULATION -	ASSEMBLY MAX U-0.055 OR R-13 + R-13 INSULATION W/ THERMAL SPACER BLOCKING
WINDOWS -	ASSEMBLY MAX U-0.35, MAX. SHGC 0.40
DOORS -	ASSEMBLY MAX U-0.80, MAX. SHGC 0.40
OVERHEAD DOORS -	ASSEMBLY MAX U-0.50, MAX. SHGC 0.40

ASSEMBLY MAX METHOD OF WALL CONSTRUCTION MUST FOLLOW ANSI/ASHRAE 90.1-2010, TABLE A3.2 ASSEMBLY U-FACTORS FOR METAL BUILDING WALLS.

ASSEMBLY MAX METHOD OF ROOF CONSTRUCTION MUST FOLLOW ANSI/ASHRAE 90.1-2010, TABLE A2.3 ASSEMBLY U-FACTORS FOR METAL BUILDING ROOFS.



1 A-3-101 **FLOOR PLAN**
SCALE: 1/4" = 1'-0"

CONSTRUCTION NOTES

#	
1	VINYL STRIP CURTAIN DOOR
2	REAR LOADING PRE-MANUFACTURED ALUMINUM MAILBOXES, SEE DETAIL 2/A-3-402
3	FIXED TOTE SHELVING, SEE DETAIL 3/A-3-402
4	FRAME AND GYPSUM WRAP AT COLUMNS, TYPICAL
5	R-16 BATT INSULATION
6	PROVIDE SOUND ATTENUATION BATT AT WALLS
7	CONCRETE WALK - SEE CIVIL
8	HANGING CANOPY (ABOVE)
9	DOWNSPOUT. TIE INTO STORM SYSTEM. SEE CIVIL DRAWINGS FOR STORM SYSTEM
10	FIRE EXTINGUISHER IN SEMI RECESSED CABINET, SEE LIFE SAFETY DRAWING G-3-101
11	PIPE BOLLARD - SEE CIVIL DRAWINGS
12	POWER / DATA POLE - RECTANGULAR ALUMINUM
13	DIMENSIONS AT INTERIOR WALLS ARE TO FACE OF STUD FOR THIS SHEET, TYPICAL
14	PROVIDE SMOKE PARTITIONS FOR INTERIOR WALLS AND CEILINGS IN THIS ROOM. SEAL PENETRATIONS AND OPENINGS.

GENERAL NOTES

1. PERFORM WORK IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS AND IN ACCORDANCE WITH THE REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION, AS WELL AS SPECIFIC REQUIREMENTS AND CONDITIONS OF ANY NECESSARY PERMITS REQUIRED FOR CONSTRUCTION, DEMOLITION AND DISPOSAL.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING HIS CONSTRUCTION ACTIVITIES WITH THOSE OF SUB-CONTRACTORS AND OTHER ENTITIES INVOLVED, IN ORDER TO ASSURE EFFICIENT AND ORDERLY DEMOLITION AND OR INSTALLATION OF EACH PART OF THE WORK.
3. CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS, DIMENSIONS AND LOCATIONS OF ITEMS TO BE AFFECTED BY DEMOLITION AND/OR CONSTRUCTION ACTIVITIES BEFORE PERFORMING SUCH WORK.
4. ALL AREAS OF LANDSCAPE OR HARDSCAPE DISTURBED BY CONSTRUCTION SHALL BE RESHAPED, GRADED TO DRAIN, SEEDED AND MULCHED OR REPAIRED / REPLACED AT THE CONTRACTORS EXPENSE, TO MATCH ORIGINAL CONDITIONS.
5. CONTRACTOR SHALL LEGALLY DISPOSE OF ALL DEMOLITION MATERIALS OFF-SITE.
6. PROTECT PERSONS, MOTOR VEHICLES, SURROUNDING SURFACES OF BUILDING, BUILDING SITE, PLANTS, AND SURROUNDING BUILDING FROM HARM RESULTING FROM WORK.
7. PREVENT SOLIDS AND DEBRIS FROM ENTERING THE DRAINAGE SYSTEM. CLEAN OUT DRAINS AND DRAIN

SCALE: 1/4" = 1'-0"

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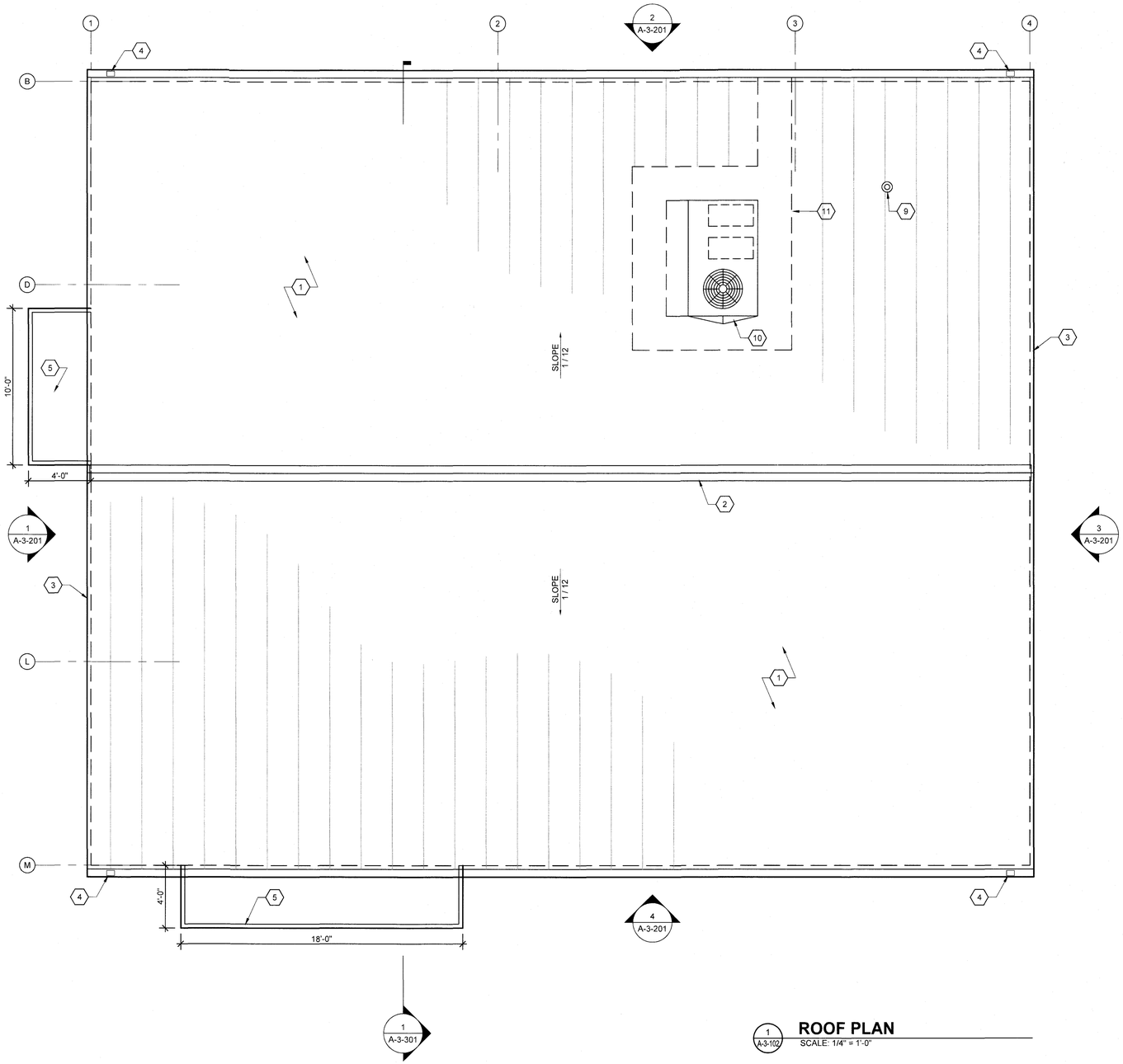
CAPITOL MAIL ROOM
ALTERNATE 1

FLOOR PLAN

STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK — NO. 23211 — REGISTERED ARCHITECT — 8/6/2021

JOB NUMBER:	19027
SCALE:	1/4" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-3-101
REVISION	△

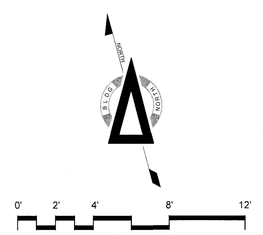
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1 A-3-102 **ROOF PLAN**
SCALE: 1/4" = 1'-0"

CONSTRUCTION NOTES

1. METAL BUILDING ROOF SYSTEM - VERTICAL-RIB, STANDING SEAM METAL ROOF PANELS
2. RIDGE CAP
3. METAL BUILDING SYSTEM - FASCIA TRIM
4. METAL BUILDING SYSTEM - GUTTERS / DOWNSPOUTS
5. PREMANUFACTURED METAL CANOPY, CENTER OVER DOOR OPENINGS
6. VTR, REFER TO PLUMBING DRAWINGS
7. GAS VENT, REFER TO MECHANICAL DRAWINGS
8. HOOD, REFER TO MECHANICAL DRAWINGS
9. VENT THRU ROOF - SEE PLUMBING
10. ROOFTOP UNIT - PROVIDE CRICKET AND CURB. REFER TO MECHANICAL DRAWINGS
11. RIB MOUNTED METAL WALKPAD SYSTEM.



SCALE: 1/4" = 1'-0"

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Charleston, West Virginia

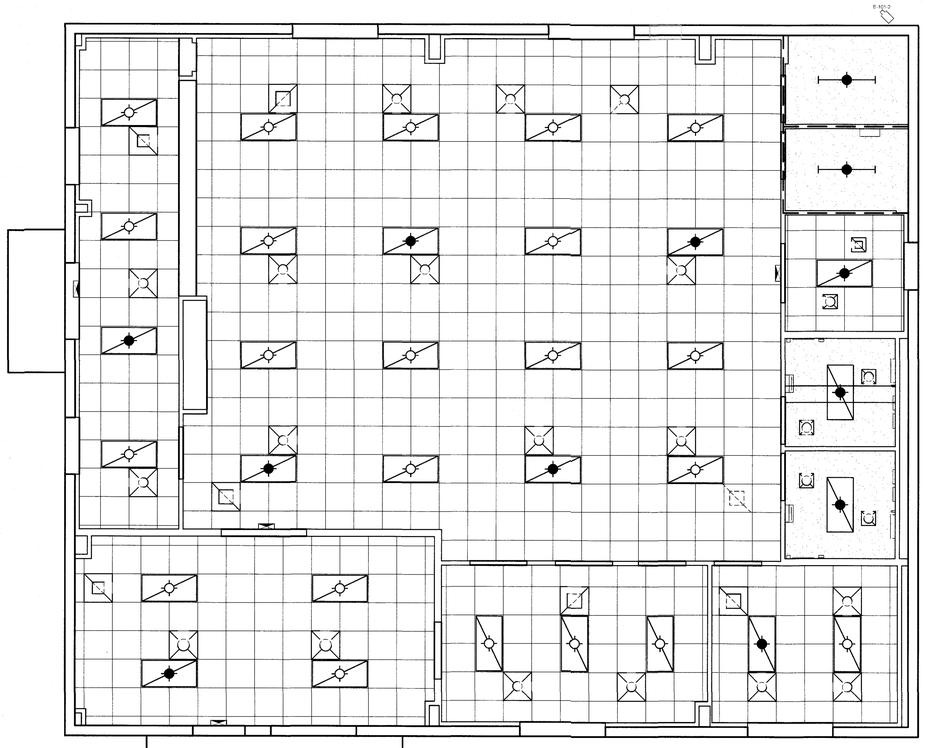
CAPITOL MAIL ROOM
ALTERNATE 1

ROOF PLAN

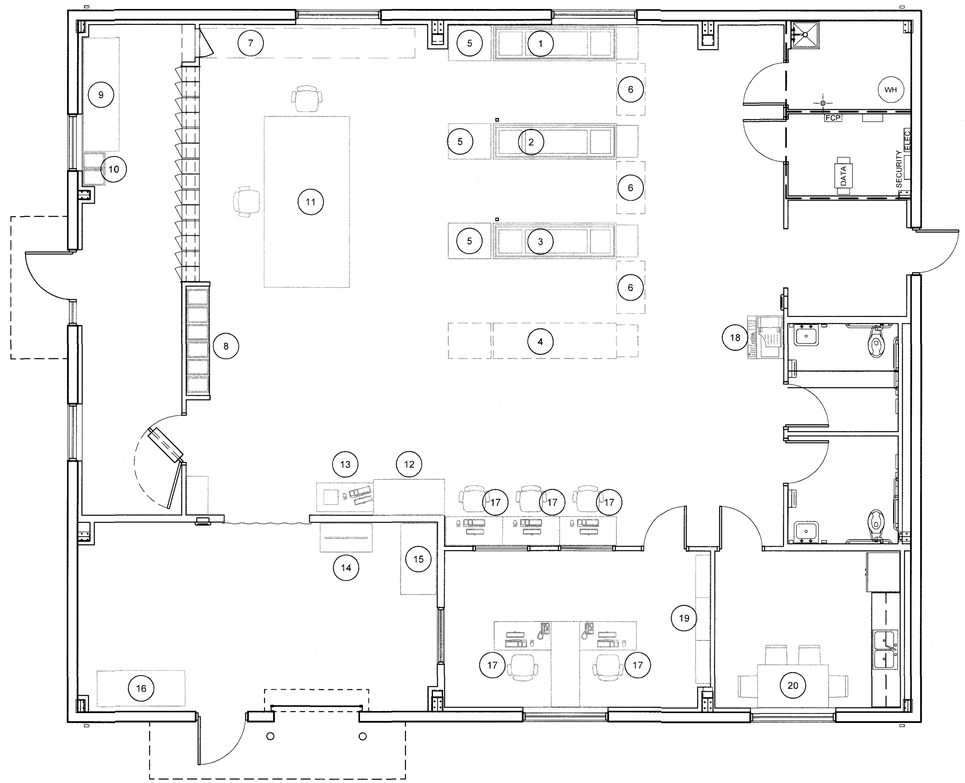
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 021
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	1/4" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-3-102
REVISION	

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1 A-3-103 REFLECTED CEILING PLAN
SCALE: 3/16" = 1'-0"



2 A-3-103 FURNITURE LAYOUT
SCALE: 3/16" = 1'-0"

LEGEND

- 2'x2' ACOUSTICAL CEILING TILE
- 2'x4' LED TROFFER LIGHT — REFER TO ELECTRICAL DRAWINGS
- LED STRIP LIGHT — REFER TO ELECTRICAL DRAWINGS
- HVAC SUPPLY DIFFUSER — REFER TO MECHANICAL DRAWINGS
- HVAC RETURN REGISTER — REFER TO MECHANICAL DRAWINGS

FURNITURE NOTES
NOTE: FURNITURE BY OWNER, U.N.O.

1. LETTER STAMPING MACHINE
2. FLAT POST STAMPING MACHINE
3. MULTI STAMPING MACHINE
4. FUTURE STAMPING
5. 30"x36" SORTING TABLE
6. 24"x44" ROLLING MAIL CART
7. PACKAGE ROLLING CONVEYOR
8. MAIL TOTES
9. 30"x8' SORTING TABLE
10. MAIL TOTE STORAGE
11. 6'X12' SORTING TABLE
12. 30"x60" SORTING TABLE
13. PARCEL METERING MACHINE
14. PARCEL STRAPPING MACHINE
15. PARCEL STORAGE TABLE
16. BIOLOGICAL SAFETY CABINET
17. DESK AND WORKSTATION
18. COPY MACHINE
19. SHELVING UNITS
20. DINING TABLE

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Charleston, West Virginia

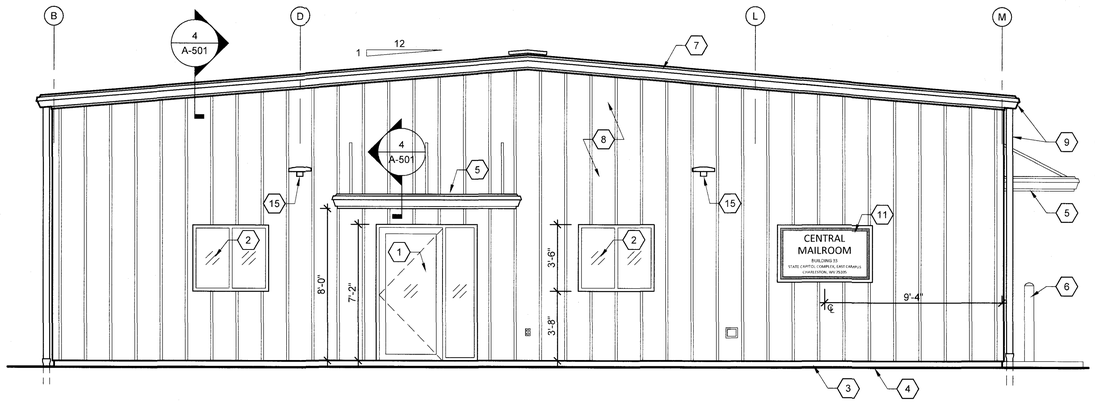
CAPITOL MAIL ROOM
ALTERNATE 1

REFLECTED CEILING AND FURNITURE LAYOUT PLAN

SEAL — STATE OF WEST VIRGINIA — PHILLIP ALAN WARNOCK NO. 15670 — REGISTERED ARCHITECT — 8/6/2021

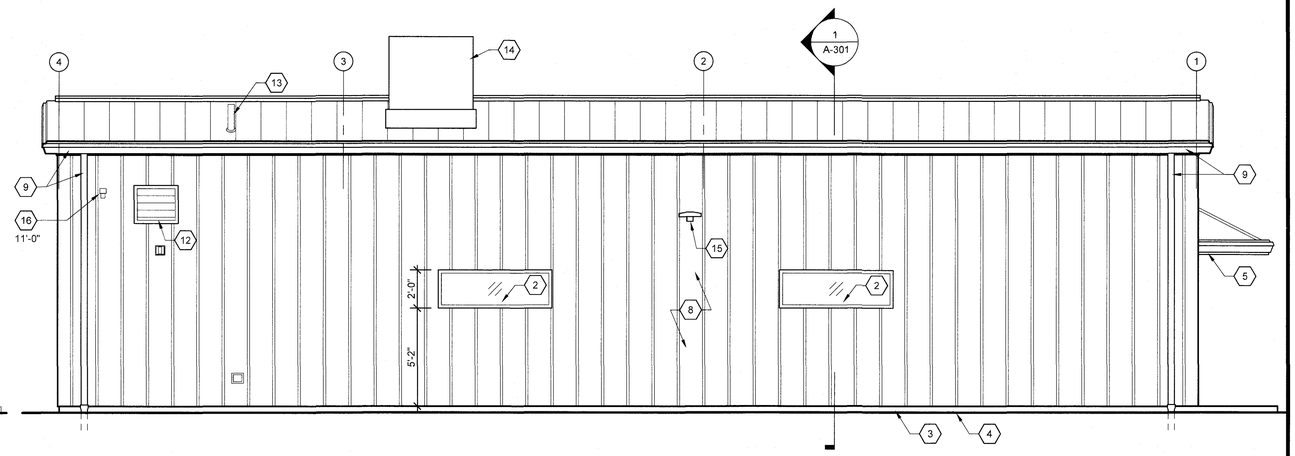
JOB NUMBER:	19027
SCALE:	3/16" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
A-3-103	

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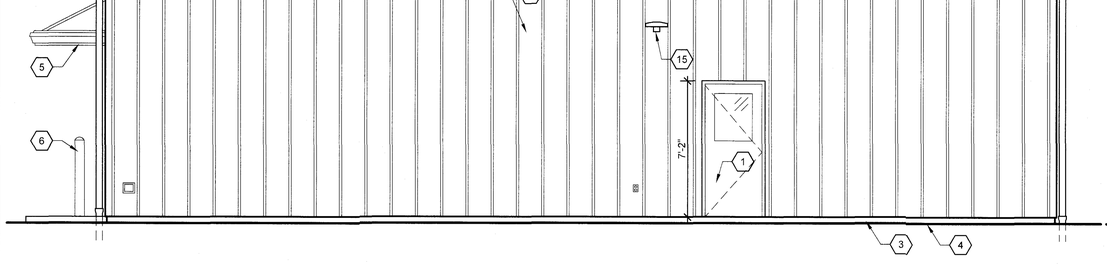
1 A-3-201 WEST ELEVATION

SCALE: 1/4" = 1'-0"



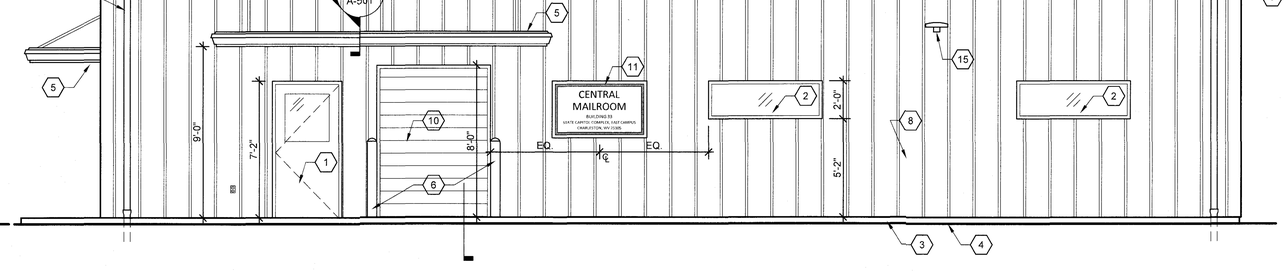
2 A-3-201 NORTH ELEVATION

SCALE: 1/4" = 1'-0"



3 A-3-201 EAST ELEVATION

SCALE: 1/4" = 1'-0"



4 A-3-201 SOUTH ELEVATION

SCALE: 1/4" = 1'-0"

CONSTRUCTION NOTES

1. DOOR AND FRAME (REFER TO DOOR SCHEDULE).
2. WINDOW, TYPICAL.
3. CONCRETE FOUNDATION SYSTEM (REFER TO STRUCTURAL DRAWINGS).
4. GRADE, ELEVATION VARIES (REFER TO CIVIL DRAWINGS).
5. PREMANUFACTURED METAL CANOPY, CENTER OVER DOOR OPENINGS.
6. PIPE BOLLARD - SEE CIVIL DRAWINGS.
7. METAL BUILDING SYSTEM - FASCIA TRIM.
8. EXTERIOR WALL SYSTEM - CONCEALED-FASTENER METAL WALL PANELS.
9. METAL BUILDING SYSTEM - GUTTERS / DOWNSPOUTS. TIE INTO STORM SYSTEM - SEE CIVIL.
10. OVERHEAD COILING DOOR ASSEMBLY.
11. BUILDING SIGNAGE. SEE DETAIL 4/A-3-402 AND SPECIFICATIONS. BY OWNER.
12. HVAC PENETRATIONS, SEE MECHANICAL DRAWINGS.
13. VENT THRU ROOF - SEE PLUMBING.
14. ROOFTOP UNIT - PROVIDE CRICKET AND CURB. REFER TO MECHANICAL DRAWINGS.
15. BUILDING LIGHTING, MOUNT AT 10'-0" A.F.F. U.N.O. SEE ELECTRICAL.
16. SECURITY CAMERA, MOUNT TOP OF CAMERA AS NOTED. SEE ELECTRICAL.

0' 2' 4' 8' 12'

SCALE: 1/4" = 1'-0"

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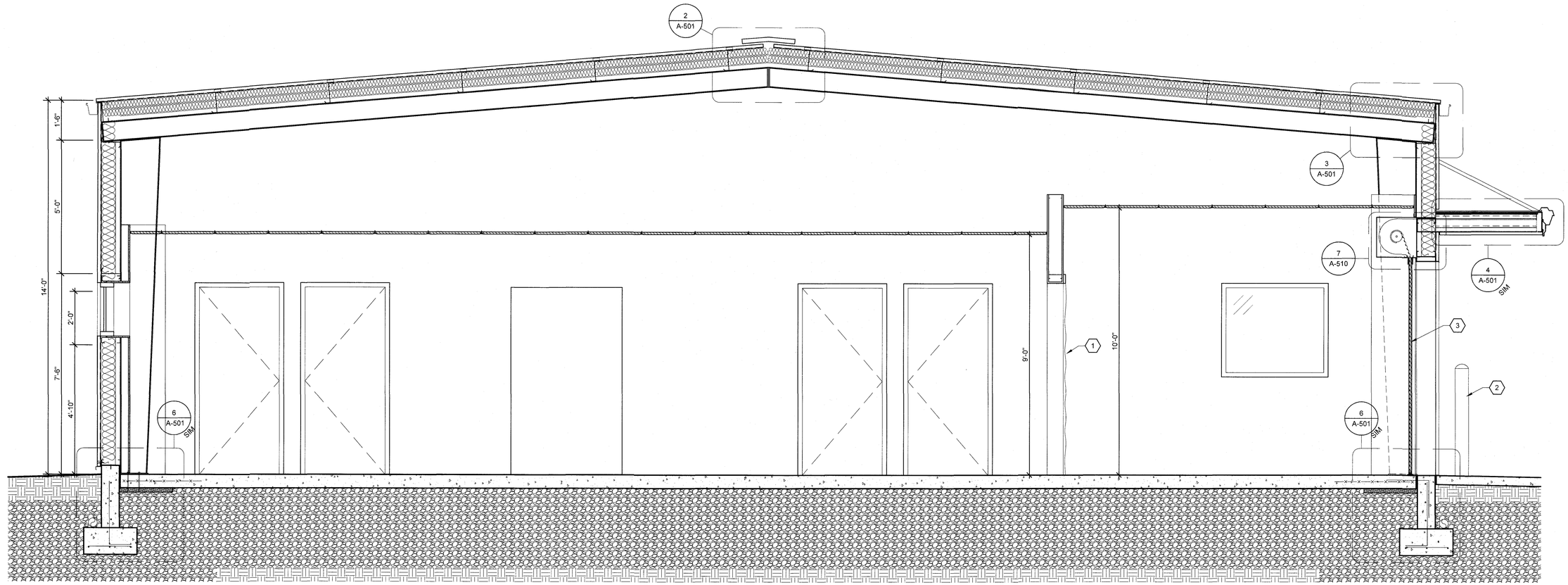
CAPITOL MAIL ROOM
ALTERNATE 1

ELEVATIONS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	1/4" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
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SHEET NO.	A-3-201
REVISION	△

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1 A-3-301 **TRANSVERSE SECTION**
SCALE: 1/2" = 1'-0"

CONSTRUCTION NOTES

1. VINYL STRIP CURTAIN DOOR
2. BOLLARD - SEE CIVIL DRAWINGS
3. OVERHEAD COILING DOOR.

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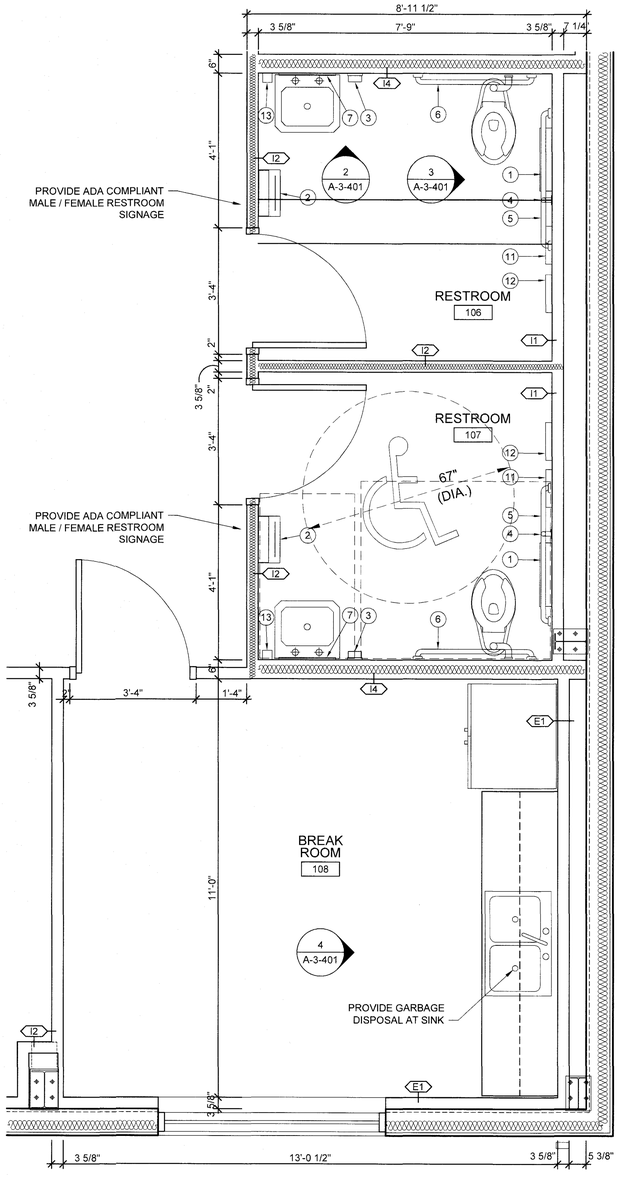
CAPITOL MAIL ROOM
ALTERNATE 1

BUILDING SECTIONS

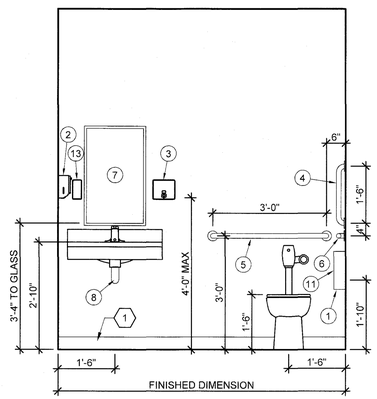
SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 017402
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	1/2" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
A-3-301	

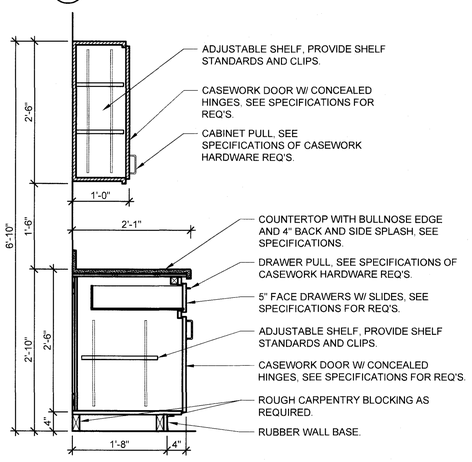
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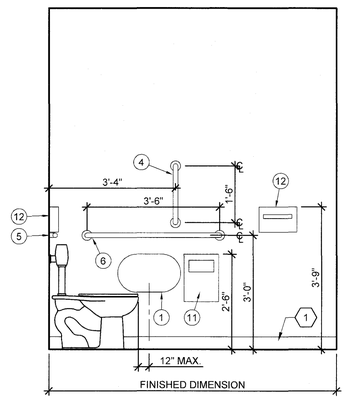
1 A-3-401 **ENLARGED PLAN**
SCALE: 1/2" = 1'-0"



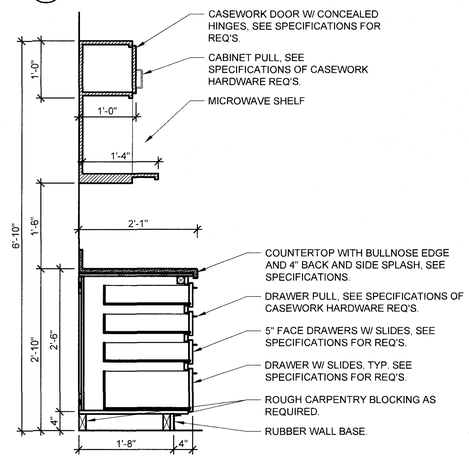
2 A-3-401 **RESTROOM**
SCALE: 1/2" = 1'-0"



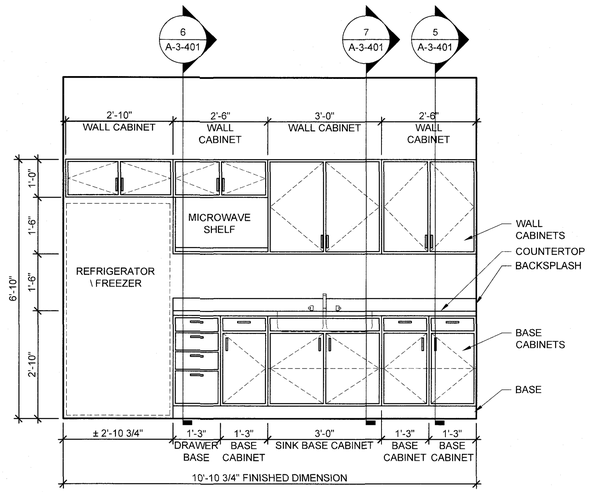
5 A-3-401 **SECTION**
SCALE: 3/4" = 1'-0"



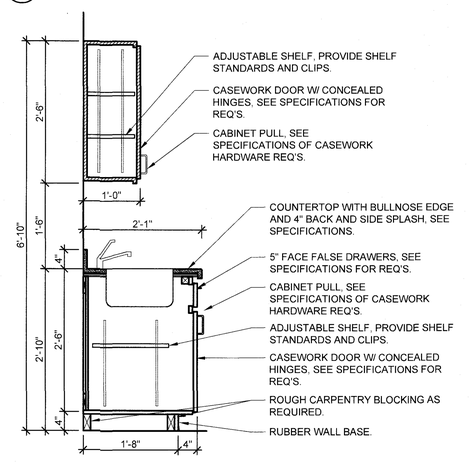
3 A-3-401 **RESTROOM**
SCALE: 1/2" = 1'-0"



6 A-3-401 **SECTION**
SCALE: 3/4" = 1'-0"



4 A-3-401 **BREAK ROOM**
SCALE: 1/2" = 1'-0"



7 A-3-401 **SECTION**
SCALE: 3/4" = 1'-0"

ACCESSORY SCHEDULE

SYMBOL	DESCRIPTION	MANUFACTURER	MFR DESIGNATION	COMMENTS
1	TOILET PAPER DISPENSER, JRT JR JUMBO ROLL	KIMBERLY CLARK	0950700	SURFACE MOUNTED, BLACK, W/STUB ROLL, NOTE 1
2	TOUCHLESS ROLL TOWEL DISPENSER	GEORGIA PACIFIC	59462A	"en MOTION", TRANSLUCENT SMOKE, NOTE 1
3	TOUCHLESS SOAP DISPENSER	GOJO	LTX12 1984-511	SURFACE MOUNTED, W/BROWN NOZZLE, NOTE 1
4	GRAB BAR	BOBRICK	B-6806.99X18	CONCEALED MOUNTING
5	GRAB BAR	BOBRICK	B-6806.99X36	CONCEALED MOUNTING
6	GRAB BAR	BOBRICK	B-6806.99X42	CONCEALED MOUNTING
7	MIRROR	BOBRICK	B-290 1830	SURFACE MOUNTED
8	UNDERLAVATORY GUARD	PLASTIC		PLASTIC
9	TRASH CAN			BY OWNER
10	MOP AND BROOM HOLDER	BOBRICK	B-224	LOCATED AT SERVICE SINK IN MECH 103
11	TOUCHLESS SANITARY NAPKIN RECEPTACLE	BOBRICK	BOB-270	SURFACE MOUNTED, STAINLESS STEEL
12	SEAT COVER DISPENSER	GEORGIA PACIFIC	57710	SURFACE MOUNTED, STAINLESS STEEL, NOTE 1
13	HAND SANITIZER DISPENSER	PURELL	TFX 2720-01	SURFACE MOUNTED, NOTE 1

NOTE:
1: TOILET ACCESSORY PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR.

GENERAL NOTES:

1. SEE CIVIL FOR FINISH FLOOR ELEVATIONS AND SITE WORK. SEE ALL OTHER DISCIPLINES FOR ASSOCIATED WORK.
2. ALL DIMENSIONS ARE TO THE FOLLOWING: FACE OF METAL STUD, FACE OF CMU WALL, FACE OF CONCRETE SLAB, FACE OF PEMB WALL GIRT, CENTERLINE OF PEMB COLUMNS UNLESS NOTED OTHERWISE.
3. SEE ROOM FINISH SCHEDULE FOR WALL / CEILING / FLOOR FINISHES.
4. ALL PRE-ENGINEERED METAL BUILDING WALL AND ROOF PANELS ARE TO BE PROVIDED WITH INTEGRAL CAPTIVE GASKETS OR SEALANT TO ENSURE AIR AND WATER TIGHT CONSTRUCTION. ALL PENETRATIONS IN THE WALL AND ROOF SYSTEM ARE TO BE SEALED OR GASKETED TO MAINTAIN THE AIR / WATER TIGHT BARRIER.

SYMBOL KEY:

1. SEE ARCHITECTURAL GENERAL SHEET A-001 FOR TYPICAL SYMBOLS AND WALL TYPES.

KEYNOTES:

1. WALL BASE - TYPICAL THROUGHOUT.

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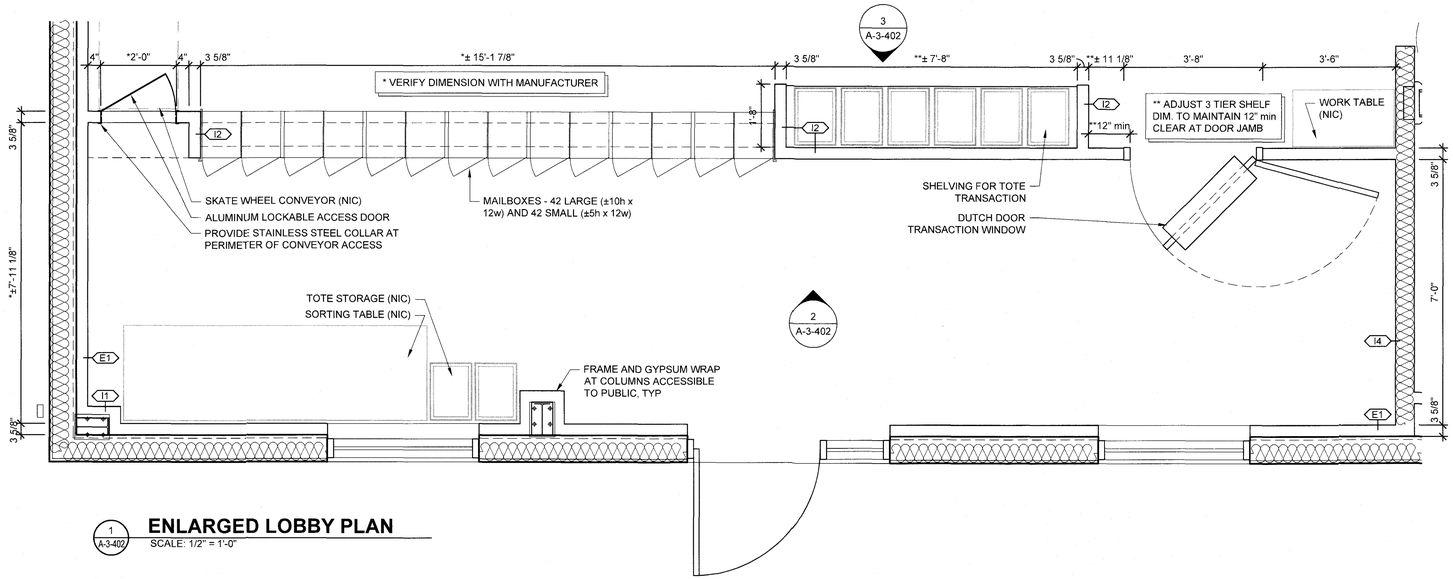
CAPITOL MAIL ROOM
ALTERNATE 1

ENLARGED PLANS AND INTERIOR ELEVATIONS

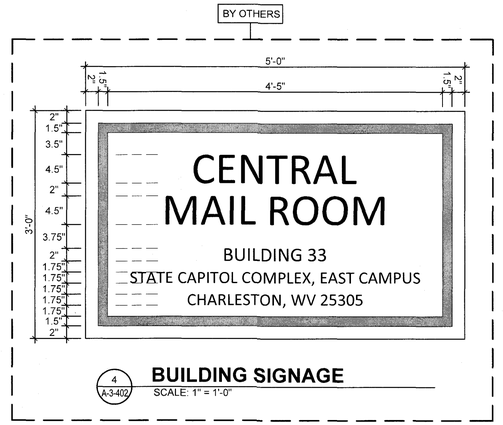
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 22621
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	VARIES
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-3-401
REVISION	

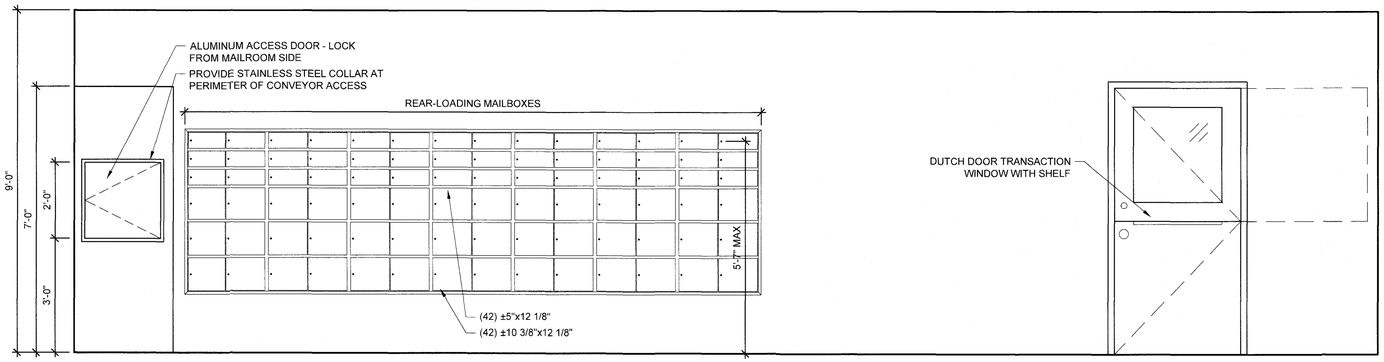
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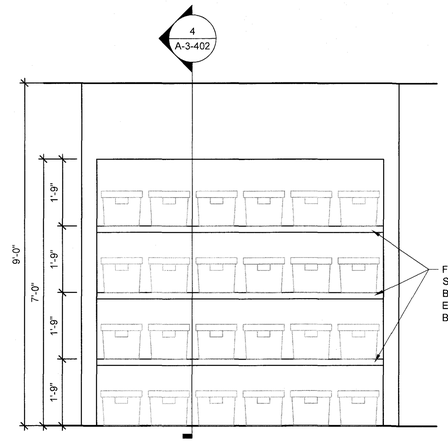
1 A-3-402 **ENLARGED LOBBY PLAN**
SCALE: 1/2" = 1'-0"



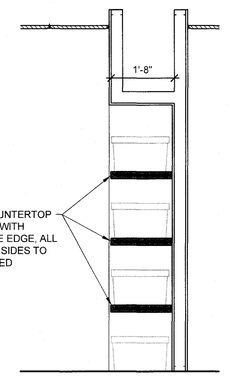
4 A-3-402 **BUILDING SIGNAGE**
SCALE: 1" = 1'-0"



2 A-3-402 **LOBBY ELEVATION**
SCALE: 1/2" = 1'-0"



3 A-3-402 **SHELVING ELEVATION**
SCALE: 1/2" = 1'-0"



4 A-3-402 **SHELVING SECTION**
SCALE: 1/2" = 1'-0"

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Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1

ENLARGED PLANS AND INTERIOR ELEVATIONS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK NO. 20241
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	1/2" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
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ROOM FINISH SCHEDULE

ROOM #	ROOM NAME	FLOOR MATERIAL	FLOOR FINISH	FLOOR BASE	WALLS MATERIAL NORTH	WALLS MATERIAL SOUTH	WALLS MATERIAL EAST	WALLS MATERIAL WEST	WALLS FINISH NORTH	WALLS FINISH SOUTH	WALLS FINISH EAST	WALLS FINISH WEST	CEILING MATERIAL	CEILING FINISH	CEILING HEIGHT	NOTES	ROOM NAME	ROOM #
101	LOBBY	VCT	-	VWB	GYP	GYP	GYP	GYP	PAINT	PAINT	PAINT	PAINT	ACT	-	9'-0"	-	LOBBY	101
102	MAIL ROOM	CON	SEALED	VWB	GYP	GYP	GYP	GYP	PAINT	PAINT	PAINT	PAINT	ACT	-	9'-0"	-	MAIL ROOM	102
103	MECHANICAL	CON	SEALED	VWB	MWP	MRG	MWP	MRG	PREFINISH	PAINT	PREFINISH	PAINT	GYP	-	9'-0"	-	MECHANICAL	103
104	ELECTRICAL	CON	SEALED	VWB	GYP	GYP	MWP	GYP	PAINT	PAINT	PREFINISH	PAINT	GYP	-	9'-0"	-	ELECTRICAL	104
105	CORRIDOR	CON	SEALED	VWB	GYP	GYP	GYP	GYP	PAINT	PAINT	PAINT	PAINT	ACT	-	9'-0"	-	CORRIDOR	105
106	RESTROOM	CT	CT	VWB	MRG	MRG	MRG	MRG	PAINT	PAINT	PAINT	PAINT	MRG	-	8'-0"	-	RESTROOM	106
107	RESTROOM	CT	CT	VWB	MRG	MRG	MRG	MRG	PAINT	PAINT	PAINT	PAINT	MRG	-	8'-0"	-	RESTROOM	107
108	BREAK ROOM	VCT	-	VWB	GYP	GYP	GYP	GYP	PAINT	PAINT	PAINT	PAINT	ACT	-	9'-0"	-	BREAK ROOM	108
109	OFFICE	CPT	-	VWB	GYP	GYP	GYP	GYP	PAINT	PAINT	PAINT	PAINT	ACT	-	9'-0"	-	OFFICE	109
110	SHIPPING	CON	SEALED	VWB	GYP	MWP	MWP	GYP	PAINT	PREFINISH	PREFINISH	PAINT	ACT	-	10'-0"	-	SHIPPING	110

ROOM FINISH SCHEDULE

NOT TO SCALE

NOTES:
ACT - ACOUSTIC CLG. TILE
CON - SEALED CONCRETE
CT - CERAMIC TILE/EPOXY GROUT
CPT - CARPET TILE
GYP. - GYPSUM BOARD, PAINTED
MRG - MOISTURE RESISTANT GYP. PAINTED
MWP - METAL WALL PANEL
VWB - VINYL WALL BASE
VCT - VINYL COMPISITION TILE

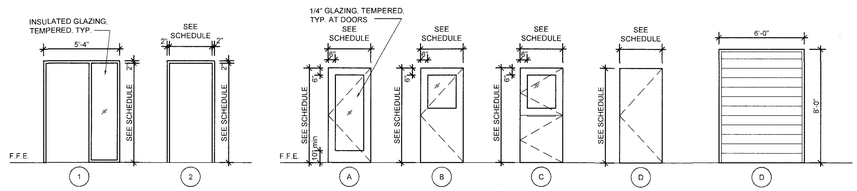
DOOR SCHEDULE

MARK	ROOM NAME	DOOR SIZE	FIRE RATING	DOOR/FRAME TYPE	FRAME MATERIAL	FRAME FINISH	DOOR MATERIAL	DOOR FINISH	HEAD DETAIL	JAMB DETAIL	SILL DETAIL	HARDWARE TYPE	MARK	ROOM NAME	COMMENTS
101	LOBBY	3'-6" X 7'-0"	--	1 / A	ALUM	ANOD	ALUM / GLASS	ANOD	1/A-510	2/A-510	3/A-510	3	101	LOBBY	
102A	MAIL ROOM	3'-6" X 7'-0"	--	2 / C	MTL	PAINT	SOLID CORE	STAIN	4/A-510	5/A-510		11	102A	MAIL ROOM	DUTCH DOOR w/ SHELF EACH SIDE
102B	MAIL ROOM	2'-0" X 2'-0"	--	-	ALUM	ANOD	ALUMINUM	ANOD	MANF	MANF	MANF	LATCH BOLT	102B	MAIL ROOM	ALUMINUM ACCESS DOOR
103	MECHANICAL	3'-0" X 7'-0"	--	2 / D	MTL	PAINT	SOLID CORE	STAIN	4/A-510	5/A-510	-	6	103	MECHANICAL	
104	ELECTRICAL	3'-0" X 7'-0"	--	2 / D	MTL	PAINT	SOLID CORE	STAIN	4/A-510	5/A-510	-	6	104	ELECTRICAL	
105A	CORRIDOR	3'-0" X 7'-0"	--	2 / D	MTL	PAINT	HOLLOW METAL	STAIN	10/A-510	11/A-510	12/A-510	10	105A	CORRIDOR	
106	RESTROOM	3'-0" X 7'-0"	--	2 / D	MTL	PAINT	SOLID CORE	STAIN	4/A-510	5/A-510	-	5	106	RESTROOM	
107	RESTROOM	3'-0" X 7'-0"	--	2 / D	MTL	PAINT	SOLID CORE	STAIN	4/A-510	5/A-510	-	5	107	RESTROOM	
108	BREAK ROOM	3'-0" X 7'-0"	--	2 / B	MTL	PAINT	S. CORE/GLASS	STAIN	4/A-510	5/A-510	-	9	108	BREAK ROOM	
109	OFFICE	3'-0" X 7'-0"	--	2 / B	MTL	PAINT	S. CORE/GLASS	STAIN	4/A-510	5/A-510	-	8	109	OFFICE	
110A	SHIPPING	3'-0" X 7'-0"	--	2 / B	MTL	PAINT	H.M. / GLASS	PAINT	10/A-510	11/A-510	12/A-510	4	110A	SHIPPING	
110B	SHIPPING	6'-0" X 7'-0"	--	-	-	-	-	-	-	-	-	2	110B	SHIPPING	CASED OPENING w/ VINYL STRIP CURTAIN
110C	SHIPPING	6'-0" X 8'-0"	--	D	ALUM	ANOD	ALUM	ANOD	7/A-502	8/A-502	9/A-502	1	110C	SHIPPING	OVERHEAD DOOR

SEE SPECIFICATIONS FOR DOOR HARDWARE INFORMATION.

DOOR SCHEDULE

NOT TO SCALE



DOOR & FRAME ELEVATIONS

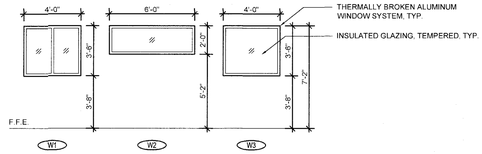
NOT TO SCALE

WINDOW SCHEDULE

MARK	SIZE WIDTH	SIZE HEIGHT	SIZE THICKNESS	TYPE	MATERIAL	FINSH EXTERIOR	FINSH INTERIOR	HEAD DETAIL	JAMB DETAIL	SILL DETAIL	COMMENTS
W1	4' - 0"	3' - 6"	4 1/2"	-	ALUMINUM	ANODIZED	ANODIZED	1/A-520	2/A-520	3/A-520	-
W2	6' - 0"	2' - 0"	4 1/2"	-	ALUMINUM	ANODIZED	ANODIZED	1/A-520	2/A-520	3/A-520	-
W3	4' - 0"	3' - 6"	4 1/2"	-	ALUMINUM	ANODIZED	ANODIZED	4/A-520	5/A-520	6/A-520	-

WINDOW SCHEDULE

NOT TO SCALE



WINDOW ELEVATIONS

NOT TO SCALE

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General Services Division
Capitol East Campus
Charleston, West Virginia

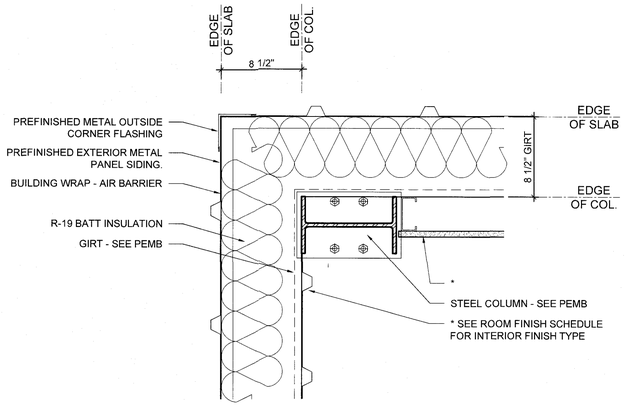
CAPITOL MAIL ROOM
ALTERNATE 1

ROOM FINISH, DOOR AND WINDOW SCHEDULES

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
REGISTERED ARCHITECT
8/6/2021

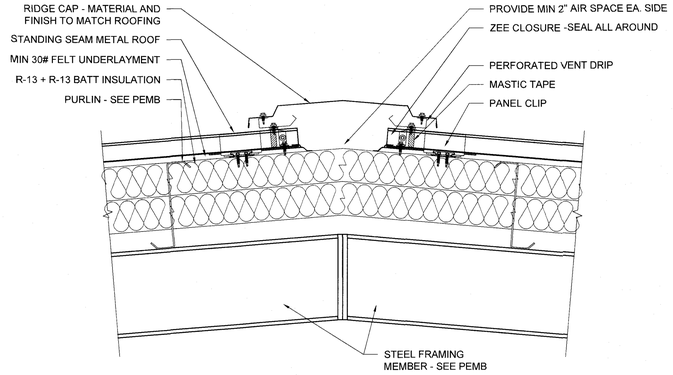
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SCALE:	N.T.S.
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-3-601
REVISION	△

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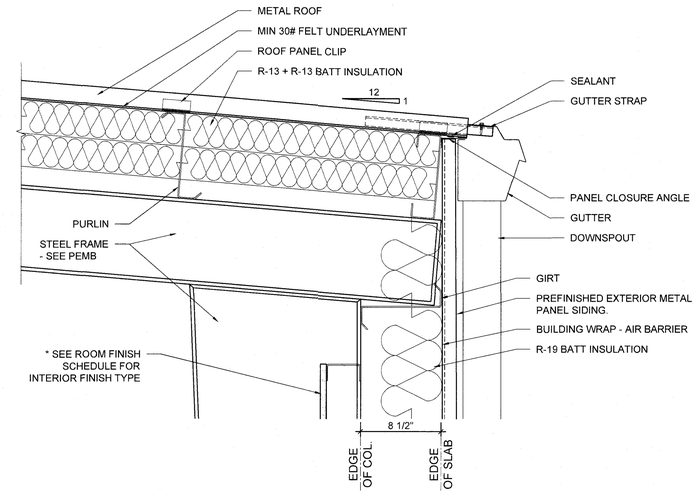
1 CORNER PLAN DETAIL

SCALE: 1 1/2"=1'-0"



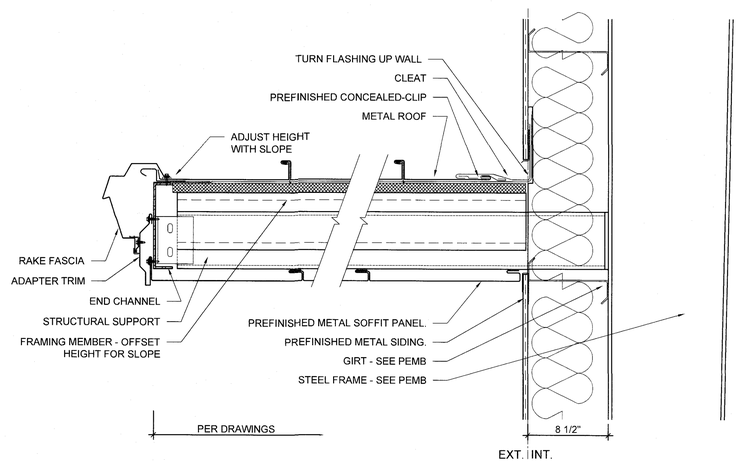
2 RIDGE DETAIL

SCALE: 1 1/2"=1'-0"



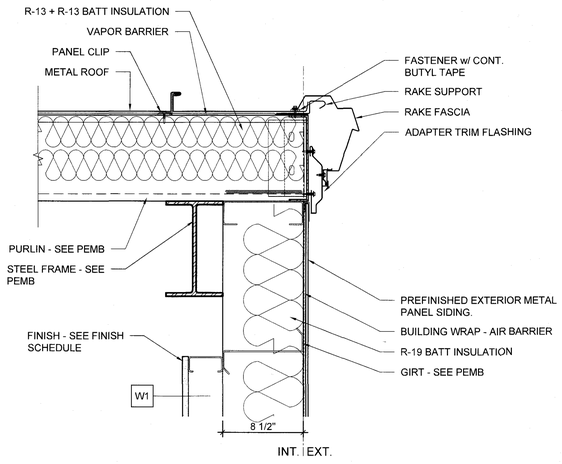
3 LOW SIDE EAVE

SCALE: 1 1/2"=1'-0"



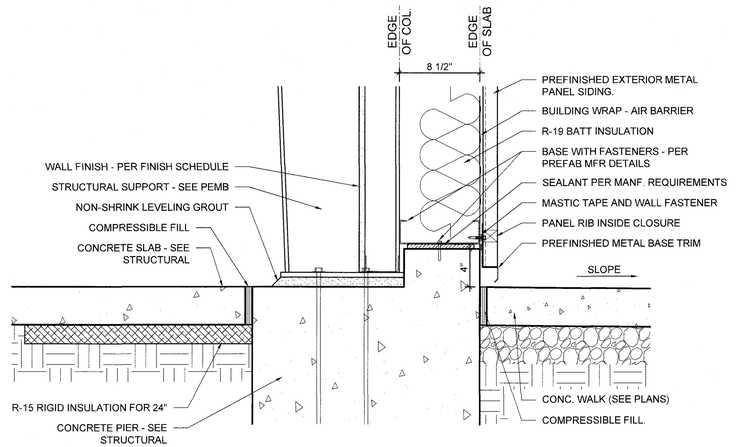
4 CANOPY

SCALE: 1 1/2"=1'-0"



5 RAKE DETAIL

SCALE: 1 1/2"=1'-0"



6 WALL TO FOUNDATION

SCALE: 1 1/2"=1'-0"

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West Virginia Department of Administration
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Charleston, West Virginia

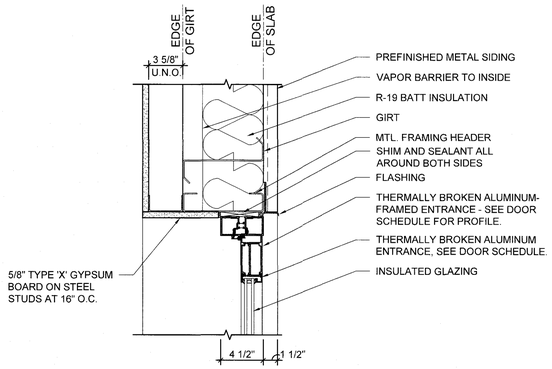
GSD MAINTENANCE/SUPPORT FACILITY AND CAPITOL MAILROOM

CONSTRUCTION DETAILS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK No. 9827
REGISTERED ARCHITECT
8/6/2021

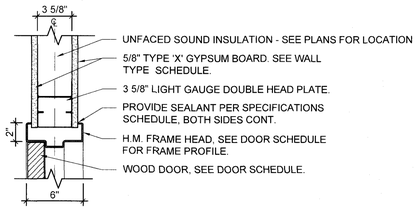
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DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-501
REVISION	△

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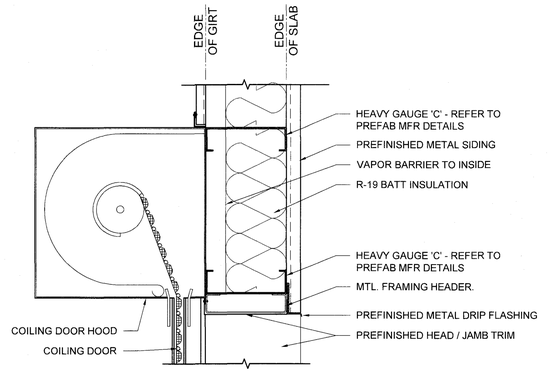
EXTERIOR PEMB ALUMINUM DOOR HEAD

1 SCALE: 1 1/2"=1'-0"



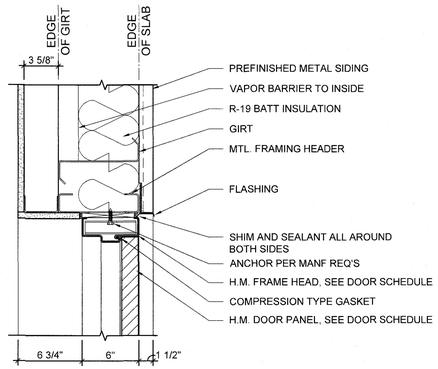
INT. DOOR HEAD DETAIL

4 SCALE: 1 1/2"=1'-0"



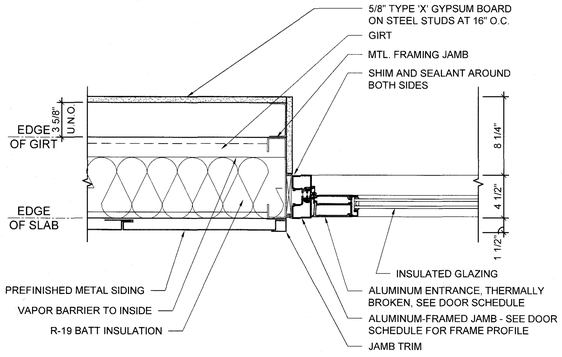
OVERHEAD DOOR HEAD @ PEMB

7 SCALE: 1 1/2"=1'-0"



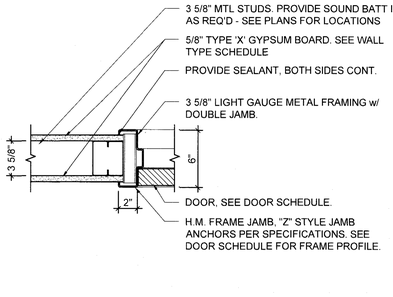
EXTERIOR PEMB METAL DOOR HEAD

10 SCALE: 1 1/2"=1'-0"



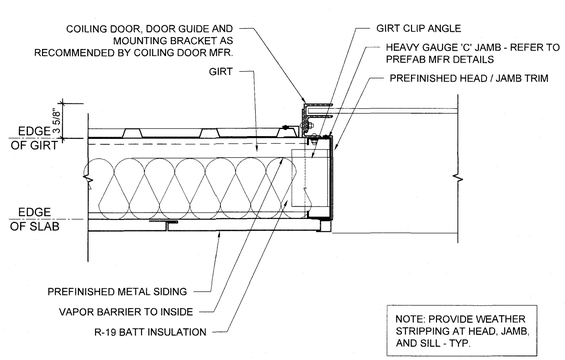
EXTERIOR PEMB ALUMINUM DOOR JAMB

2 SCALE: 1 1/2"=1'-0"



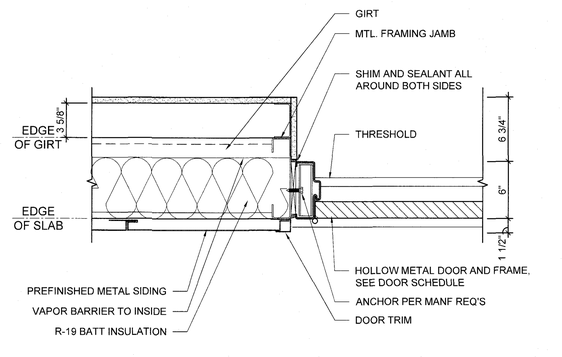
INT. DOOR JAMB DETAIL

5 SCALE: 1 1/2"=1'-0"



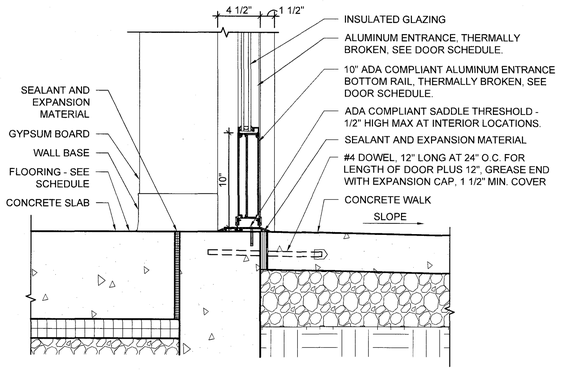
OVERHEAD DOOR JAMB @ PEMB

8 SCALE: 1 1/2"=1'-0"



EXTERIOR PEMB METAL DOOR JAMB

11 SCALE: 1 1/2"=1'-0"

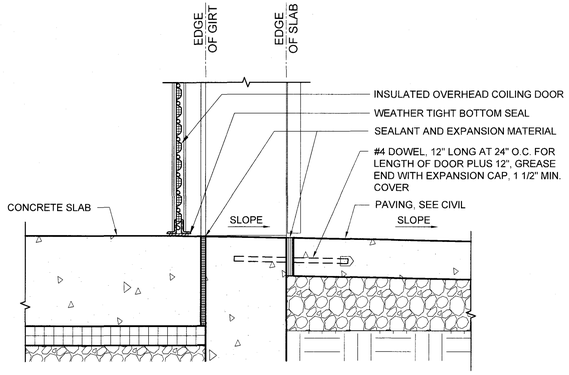


EXTERIOR PEMB ALUMINUM DOOR SILL

3 SCALE: 1 1/2"=1'-0"

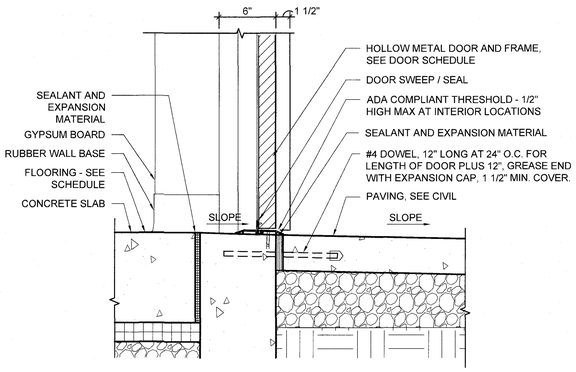
6 NOT USED

SCALE: 3/4"=1'-0"



OVERHEAD DOOR SILL @ PEMB

9 SCALE: 1 1/2"=1'-0"



EXTERIOR PEMB METAL DOOR SILL

12 SCALE: 1 1/2"=1'-0"

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Capitol East Campus
Charleston, West Virginia

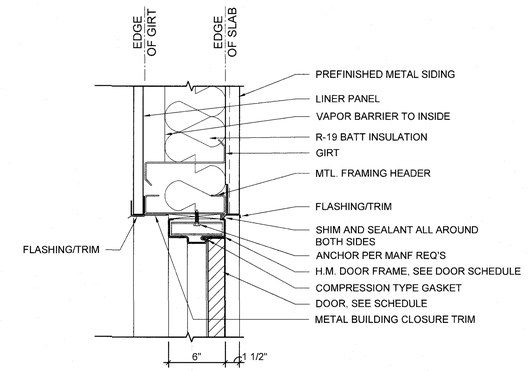
GSD MAINTENANCE/SUPPORT FACILITY AND CAPITOL MAILROOM

DOOR DETAILS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
REGISTERED ARCHITECT
8/6/2021

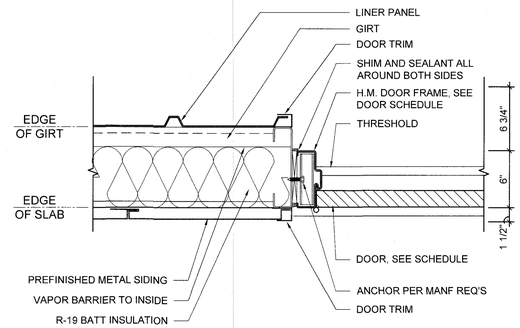
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DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
A-510	

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1 EXTERIOR PEMB METAL DOOR HEAD

SCALE: 1 1/2"=1'-0"



2 EXTERIOR PEMB METAL DOOR JAMB

SCALE: 1 1/2"=1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

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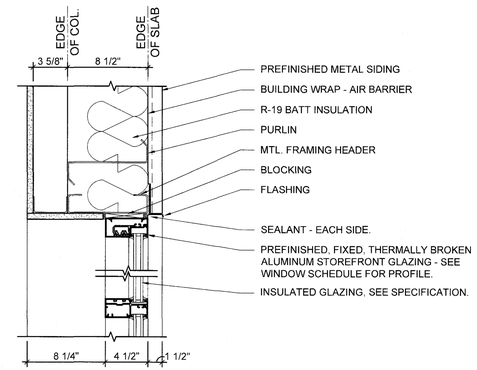
GSD MAINTENANCE/SUPPORT FACILITY AND CAPITOL MAILROOM

DOOR DETAILS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 9821
REGISTERED ARCHITECT
8/6/2021

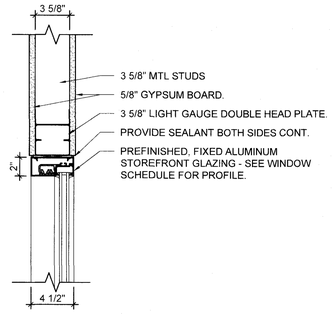
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DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	A-511
REVISION	△

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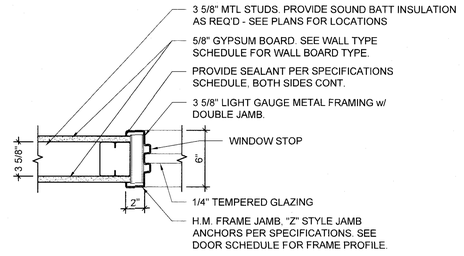
1 EXT. PEMB ALUMINUM WINDOW HEAD

SCALE: 1 1/2"=1'-0"



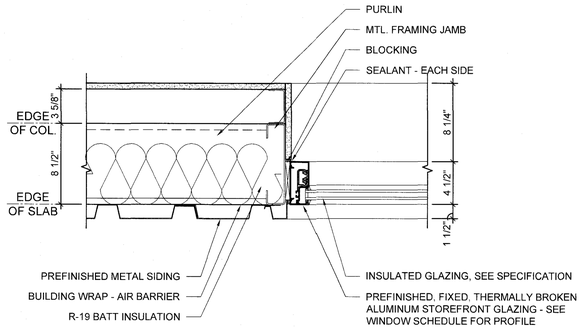
4 INT. ALUM. WINDOW HEAD

SCALE: 1 1/2"=1'-0"



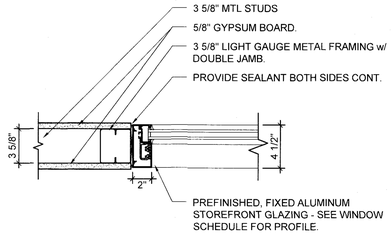
7 INT. WINDOW JAMB DETAIL

SCALE: 1 1/2"=1'-0"



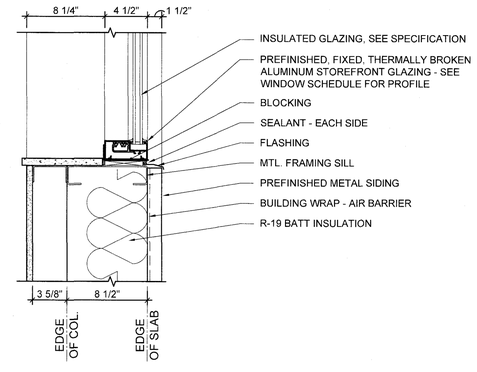
2 EXT. PEMB ALUMINUM WINDOW JAMB

SCALE: 1 1/2"=1'-0"



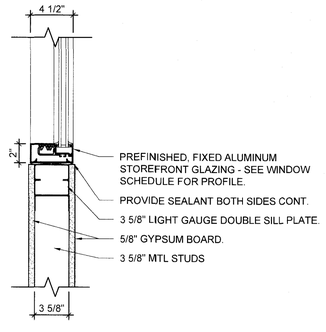
5 INT. ALUM. WINDOW JAMB

SCALE: 1 1/2"=1'-0"



3 EXT. PEMB ALUMINUM WINDOW SILL

SCALE: 1 1/2"=1'-0"



6 INT. ALUM. WINDOW SILL

SCALE: 1 1/2"=1'-0"

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Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY AND CAPITOL MAILROOM

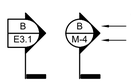
WINDOW DETAILS

SEAL
STATE OF WEST VIRGINIA
PHILLIP ALAN WARNOCK
NO. 3521
REGISTERED ARCHITECT
8/6/2021

JOB NUMBER:	19027
SCALE:	1 1/2" = 1'-0"
DATE:	AUGUST 6, 2021
DRAWN BY:	JDR
DESIGNED BY:	JDR
CHECKED BY:	PAW
SHEET NO.	REVISION
A-520	

G:\CTG\19\19027-CapitolEastMaining Drawings\AutoCAD\19027-A-0-520.dwg, 8/4/2021 10:58:50 AM, JDurosin

GENERAL LEGEND



APPEARS ON SHEET WHERE SECTION IS CUT
SECTION IDENTIFICATION LETTER
SHEET WHERE SECTION IS DRAWN



APPEARS ON THE SHEET WHERE SECTION IS DRAWN
SECTION OR DETAIL IDENTIFICATION LETTER
SHEET WHERE DRAWN



PLAN MATCH LINE SYMBOL

123 — ROOM NUMBER

9'-6" — CEILING HEIGHT

AFF — ABOVE FINISHED FLOOR

TOP, BOP — TOP OF PIPE, BOTTOM

FIRE PROTECTION LEGEND



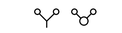
VALVE IN PIT



FIRE RISER



FIRE HYDRANT (FH)



FIRE DEPT. CONNECTION (FDC)
(SIAMESE: WALL, POST)



FIRE DEPT. CONNECTION (FDC)
(SINGLE: WALL, POST)



ZONE CONTROL VALVE SET
(SEE DETAILS)



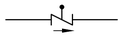
TEST VALVE HEADER



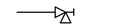
POST INDICATOR VALVE (PIV)



WATER MOTOR ALARM (GONG)



ALARM CHECK VALVE



ANGLE HOSE (HV) OR DRAIN VALVE



LIGHT HAZARD



ORDINARY HAZARD (GROUP 1)



ORDINARY HAZARD (GROUP 2)

FIRE PROTECTION PIPE

SPRINKLER HAZARD CLASSIFICATION AREA

AD — ACCESS DOOR

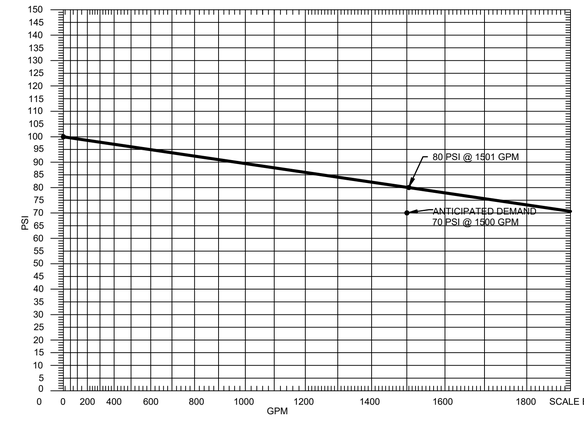
NOTE: LEGENDS ALSO APPEAR ON INDIVIDUAL PLANS, SCHEDULES AND DETAILS.

FIRE PROTECTION GENERAL NOTES:

1. PROVIDE ALL WORK NECESSARY FOR THE COMPLETE FIRE PROTECTION SYSTEM AS INDICATED AND NOTED, INCLUDING ALL CONNECTIONS TO EXISTING WORK, NEW PIPING AND ACCESSORIES AND FINAL FINISH MOUNTING OF SPRINKLERS IN LOCATIONS INDICATED AND TESTING, ALL AS REQUIRED TO MEET ALL PROVISIONS OF NFPA-13 AND THE KY BUILDING CODE. WORK SHALL BE PERFORMED BY A LICENSED SPRINKLER CONTRACTOR AND SHALL BE ACCOMPANIED BY CERTIFICATIONS OF INSPECTION AND APPROVAL BY THE DEPT. OF HOUSING, BUILDINGS AND CONSTRUCTION. ALL SCREWED PIPING SHALL BE MINIMUM SCH 40 STEEL. ALL VICTAULIC TYPE PIPING SHALL BE MINIMUM SCH 10 STEEL.
2. FIRE PROTECTION COMPONENTS, INCLUDING BUT NOT LIMITED TO PUMPS, VALVES, PIPE & FITTINGS, CONTROL SYSTEMS AND TRIM SHALL BE UL AND/OR FM LISTED FOR FIRE SERVICE, WHERE SUCH LISTING EXISTS.
3. PROVIDE LISTED AIR RELEASE FOR ALL TRAPPED RUNS OF FIRE PROTECTION PIPING.
4. ALL FERROUS FIRE PROTECTION PIPING SHALL BE PAINTED RED WHERE EXPOSED TO VIEW; SHADE TO BE APPROVED BY ENGINEER.
5. ALL FIRE PROTECTION SHUTOFF VALVES SHALL BE SUPERVISED BY THE ALARM SYSTEM EXCEPT ON JOCKEY PUMP AND BYPASS.
6. FIRE PROTECTION PIPING CONNECTIONS MAY BE WELDED, FLANGED, SCREWED OR GROOVE-JOINT TYPE PER NFPA-13, 14, 20 AND THE SPECIFICATIONS FOR THIS PROJECT. NO SCREWED PIPING LARGER THAN 2 INCHES. PITCH ALL PIPING TO DRAIN.
7. SPRINKLERS SHALL BE CENTERED IN 2' x 2' SPACE IN EITHER 2' x 2' OR 2' x 4' GRID LAYOUT.
8. COORDINATE ALL WORK. COORDINATE ALL PIPING AND ACCESSORIES WITH BOTH NEW AND EXISTING MECHANICAL AND ELECTRICAL WORK INCLUDING HVAC, PLUMBING, ELECTRICAL, FIRE ALARM AND COMMUNICATIONS. DO NOT MOUNT SPRINKLERS OR HANG PIPING SUCH AS TO BLOCK ACCESS TO HVAC OR ELECTRICAL EQUIPMENT OR THE CHANGEOUT OF EQUIPMENT WHEN NECESSARY.
9. PROVIDE SPECIAL SPRINKLERS AS REQUIRED FOR COMPLETE DESIGN. PROVIDE HIGH TEMPERATURE HEADS FOR AREAS NEAR SPACE HEATING OUTLETS AND EQUIPMENT.
10. HAZARD CLASSIFICATION IS BASED ON INFORMATION KNOWN AT THE TIME OF DESIGN. HAZARD CLASSIFICATION MAY CHANGE AS BUILDING PROGRESSES.
11. FIRE SYSTEM EXTERIOR APPURTENANCES SHALL BE FINISHED IN EITHER BRASS OR FACTORY FINISH RED (SIAMESE, WATER GONG, TRIM RING, ETC.) PER THE BASE STANDARD FINISH STYLE.
12. A TEST VALVE (INSPECTORS TEST STATION) SHALL BE INSTALLED FOR EACH WET PIPE SYSTEM AND DRY PIPE SYSTEM. PROVIDE SMOOTH BORE STEEL ORIFICE GIVING A FLOW RATE EQUIVALENT TO ONE SPRINKLER.
13. PROVIDE HEAVY GAUGE GALVANIZED STEEL HOODS AND SHIELDS (OR STAINLESS STEEL) THAT ARE SHOP FABRICATED FOR ELECTRICAL ROOMS AND COMMUNICATION ROOMS TO PROTECT ELECTRICAL EQUIPMENT FROM WATER SPRAY WHERE A SPRINKLER SYSTEM IS INSTALLED. DRAINAGE FROM THESE HOODS SHALL BE DIRECTED TO FLOOR DRAINS.
14. ANY AND ALL DAMAGE DUE TO DEMOLITION OR CONSTRUCTION IS TO BE REPAIRED OR REPLACED AS APPROPRIATE, SUBJECT TO ENGINEER'S APPROVAL, AND AT NO ADDITIONAL COST TO THE OWNER.
15. SEE ALSO DIAGRAMS, DETAILS OR SECTIONS FOR SIZES NOT SHOWN ON PLANS.
16. ALL EXISTING EQUIPMENT SHUTDOWNS OR INTERRUPTIONS OF UTILITY SERVICE REQUIRED FOR COMPLETION OF THE WORK SHALL BE SCHEDULED IN ADVANCE, AS REQUIRED BY THE OWNER.
17. CONTRACTOR IS RESPONSIBLE FOR MAKING ALL REQUIRED CONNECTIONS FOR A COMPLETE SYSTEM. SYMBOLS MISSING FROM THE DRAWINGS DO NOT EXCUSE THE CONTRACTOR FROM PROVIDING THE WORK.
18. ALL FIRE PROTECTION PIPING, FITTINGS, RESTRAINTS, HANGERS AND FASTENERS SHALL BE INSTALLED FOR SEISMIC PROTECTION IN ACCORDANCE WITH NFPA-13 AS REQUIRED.
19. EXAMINE THE CONTRACT DOCUMENTS AND IMMEDIATELY REPORT ANY ERROR, DISCREPANCY OR OMISSION. THE ENGINEER WILL DETERMINE WHICH INTERPRETATION TAKES PRECEDENCE WHERE TWO OR MORE CONFLICTING STATEMENTS OCCUR. OTHERWISE, THE CONTRACTOR IS RESPONSIBLE FOR THE MORE STRINGENT (OR EXPENSIVE) INTERPRETATION. IN GENERAL, SCHEDULES, WHEREVER THEY APPEAR, SUPERSEDE SPECIFICATIONS AND SPECIFICATIONS SUPERSEDE PLANS.
20. GENERAL NOTES, WHEREVER THEY ARE FOUND, APPLY TO ALL WORK IN THE PROJECT, UNLESS OTHERWISE INDICATED. SHEET NOTES, UTILIZING NOTE SYMBOLS, APPLY ONLY TO THE SHEET ON WHICH THEY ARE FOUND, UNLESS OTHERWISE STATED. THE MEANING OF NOTE SYMBOLS AND NUMBERS VARIES FROM SHEET TO SHEET.
21. CONTRACTOR SHALL UTILIZE ALL INFORMATION IN THE CONTRACT DOCUMENTS FOR PROVIDING THE WORK. CONTRACTOR SHALL UTILIZE DETAILS AND FLOW DIAGRAMS FOR THE WORK WHERE APPROPRIATE, WHETHER OR NOT THEY ARE SPECIFICALLY REFERENCED ON THE PLANS OR SUPPORTING DRAWINGS.
22. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONTRACT DOCUMENTS ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ANY WORK RELATING TO THOSE CONDITIONS IS PERFORMED.
23. LEGENDS OR LISTS OF SYMBOLS AND ABBREVIATIONS ARE GENERAL IN NATURE AND MAY CONTAIN ITEMS NOT USED IN THE CONTRACT DOCUMENTS. IF ANY SUCH ITEMS ARE FOUND WHICH ARE NOT DEFINED ON THE PLANS OR IN THE SPECIFICATIONS, THE ENGINEER SHALL BE CONTACTED FOR CLARIFICATION BEFORE THE BID.
24. CONTRACTOR SHALL MAINTAIN A SET OF PROJECT RECORD DRAWINGS AT THE JOB SITE AND SHALL BE RESPONSIBLE FOR MAKING CLEAR, NEAT CHANGES TO THE DRAWINGS, REFLECTING CHANGES TO THE WORK AND VARIANCE IN EXISTING CONDITIONS.
25. PROVIDE ALL MISCELLANEOUS STEEL, AS REQUIRED, TO SUPPORT ALL PIPING SYSTEMS AND EQUIPMENT. DO NOT HANG ANYTHING FROM STEEL, COMPOSITION OR WOODEN DECKS. NON-ROOF CONCRETE DECKS MAY BE USED ONLY WITH PERMISSION OF THE ENGINEER. DO NOT HANG ANYTHING FROM MECHANICAL OR ELECTRICAL ITEMS.
26. NO STEEL STRUCTURAL MEMBERS SHALL BE CUT, BURNED, WELDED OR DRILLED WITHOUT SPECIFIC PERMISSION OF THE ENGINEER.
27. ALL EQUIPMENT, ACCESSORIES, PIPING, WIRING, AND OTHER WORK, WHICH IS INSTALLED IN FINISHED SPACES SHALL BE CONCEALED IN WALLS, FLOORS, FURRED CHASES OR SUSPENDED CEILINGS, EXCEPT WHERE OTHERWISE INDICATED.
28. PROVIDE ALL ACCESS DOORS AS SHOWN, EXCEPT THOSE SPECIFIED UNDER OTHER DIVISIONS. IN ADDITION, PROVIDE ANY OTHER ACCESS DOORS WHETHER OR NOT SHOWN ON PLANS, NECESSARY FOR ACCESS TO CONCEALED EQUIPMENT, VALVES, ALARM ACTUATORS, JUNCTION BOXES, CONTROLS OR OTHER OPERATIONAL OR SERVICEABLE ITEMS, UNLESS ITEM IS REASONABLY ACCESSIBLE THROUGH LAY-IN CEILING PANELS.

FIRE FLOW TEST

STATIC PRESSURE	100 PSI
RESIDUAL PRESSURE	80 PSI
PITOT	-
VOLUME FLOW RATE	1,501 GPM
ELEVATION	599.55'
FLOW HYDRANT LOCATION	HYDRANT NUMBER 160
STATIC/RESIDUAL HYDRANT LOCATION	-
DATE / TIME	AUGUST 19, 2020



FIRE FLOW GRAPH

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
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ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING

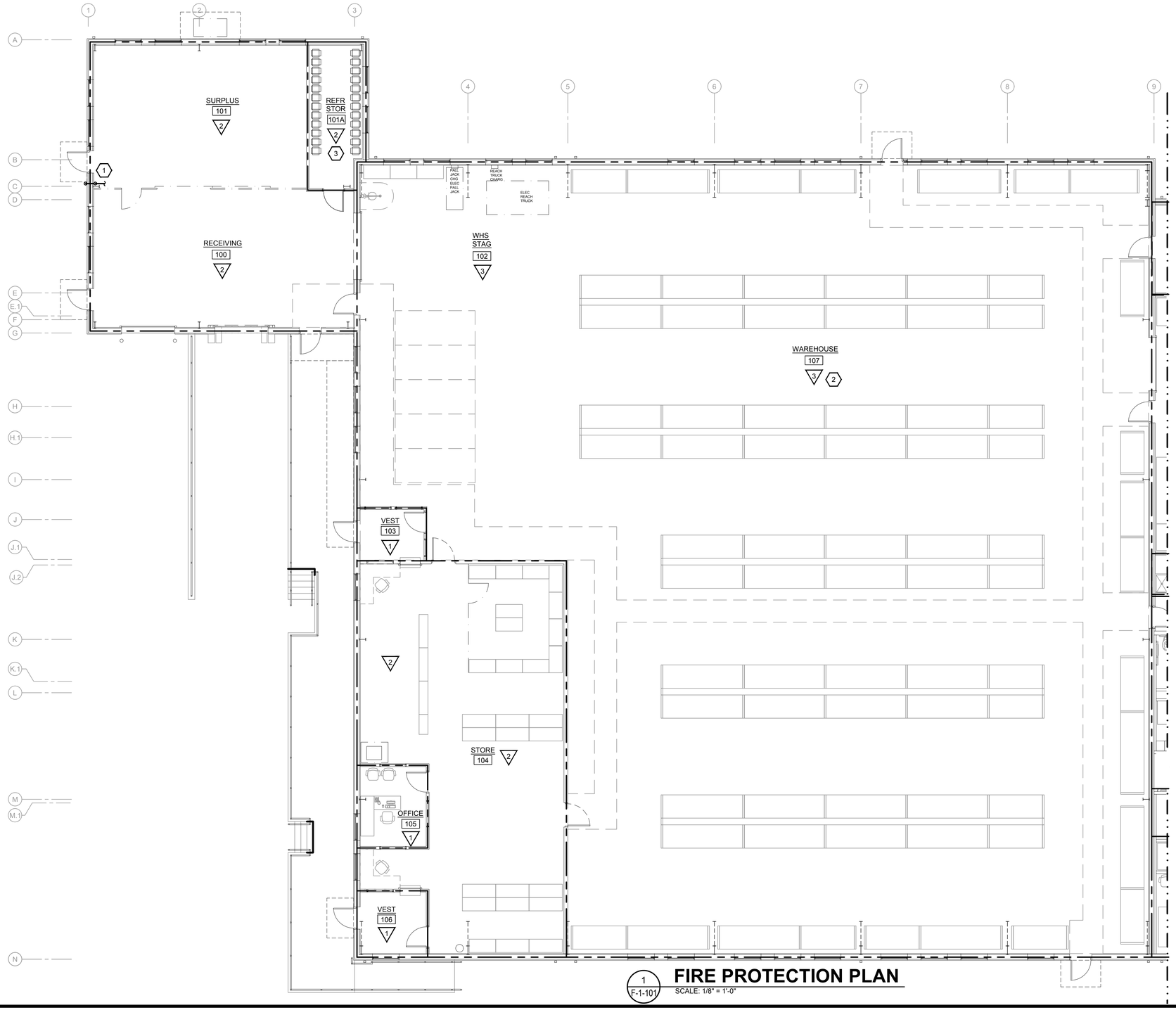
St. Albans, WV
(304) 727-5501
Buckhannon, WV
(304) 472-8914
www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

FIRE PROTECTION
LEGEND, GENERAL NOTES AND
FIRE FLOW TEST DATA AND GRAPH

CORY SHARRARD
REGISTERED
26755
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8/31/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	CVS
CHECKED BY:	CVS
SHEET NO.	REVISION
F-001	△



1 F-1-101

FIRE PROTECTION PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. DO NOT INSTALL ANY PIPES ABOVE ANY ELECTRICAL EQUIPMENT.

⬡ SHEET KEYNOTES:

1. SPRINKLER INSPECTOR'S TEST STATION. SEE DETAIL, SHEET F-500.
2. WAREHOUSE STAGING & WAREHOUSE WILL HAVE RACK STORAGE UP TO 20'-0" HIGH. PROVIDE WITH ESFR HEADS IN LIEU OF IN RACK SPRINKLERS. THE INITIAL OWNER STORAGE INFORMATION IS AS FOLLOWS (FIELD VERIFY WITH OWNER REGARDING FURTHER STORAGE INFORMATION BEFORE DESIGNING SYSTEM):
   - 2.1.1. COMMODITY CLASSIFICATIONS
   - 2.1.2. CLASS I: 53%
   - 2.1.3. CLASS II: 1%
   - 2.1.4. CLASS III: 40%
   - 2.1.5. CLASS IV: 1%
   - 2.1.6. PLASTIC GROUPS
   - 2.1.1. GROUP A: 98%
   - 2.1.2. GROUP B: 1%
   - 2.1.3. GROUP C: 1%
3. REFRIGERANT STORAGE ROOM - THE FOLLOWING REFRIGERANTS WILL BE STORED:

   R-22 IN #30 TANKS
   R-410A IN #25 TANKS
   R-407C IN #25 TANKS
   R-134A IN #30 TANKS
   NITROGEN IN 40-60 LB CAPACITY

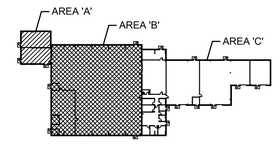
HAZARD CLASSIFICATION ▽

USE CLASSIFICATION REQUIRED BY CODE, BUT NO LESS THAN:

1. LIGHT HAZARD - VESTIBULES, OFFICES, & RESTROOMS.
2. ORDINARY HAZARD (GROUP 1) - STORAGE/TOOLS ROOMS, RECEIVING & SURPLUS.
3. ORDINARY HAZARD (GROUP 2) - WAREHOUSE STAGING & WAREHOUSE.

FIRE FLOW TEST

SEE SHEET F-001 FOR FLOW TEST INFORMATION AND FLOW GRAPH.



KEYPLAN

0' 4' 8' 16' 24'

SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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St. Albans, WV
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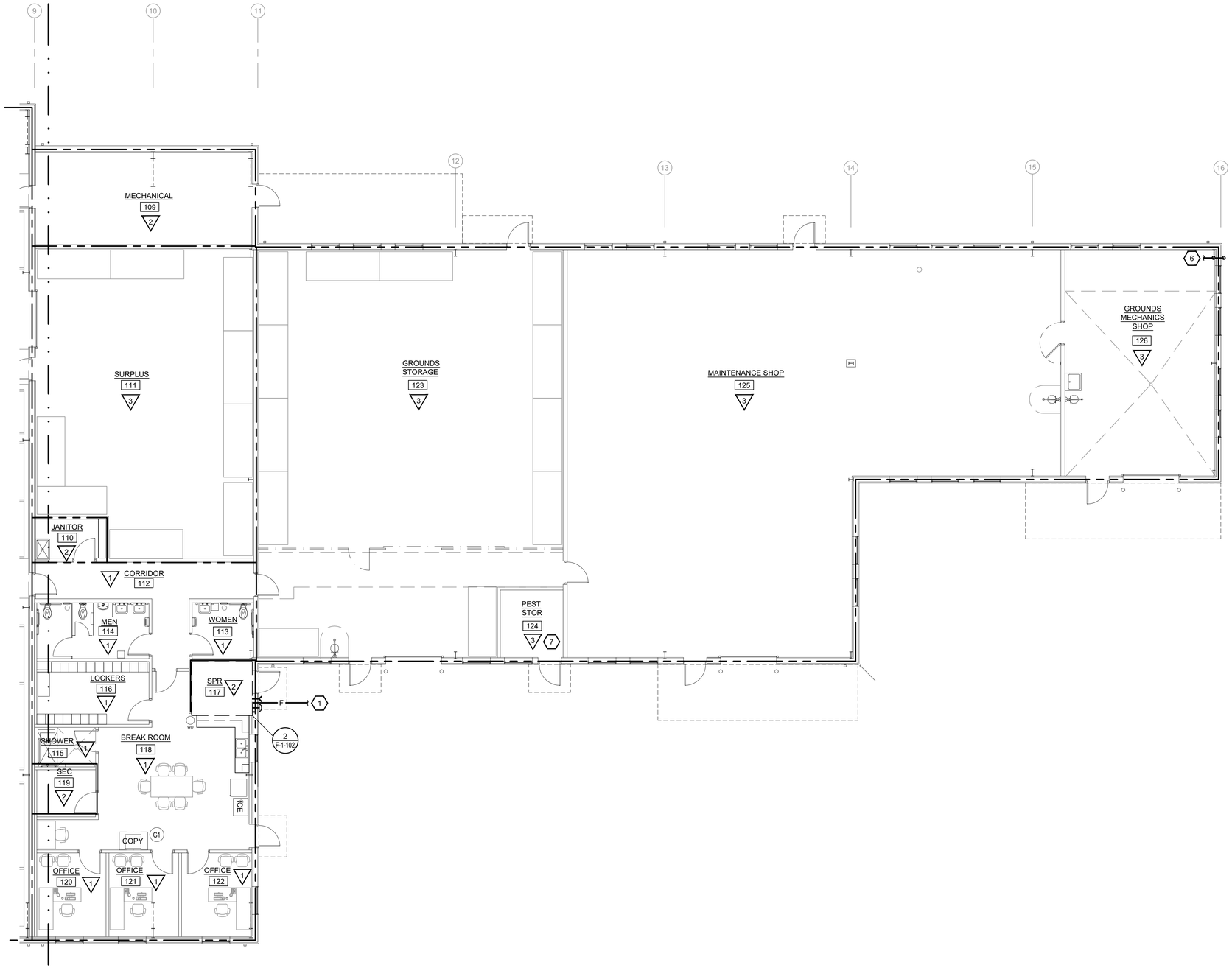
www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREAS "A" & "B"
FIRE PROTECTION PLAN

CORY V. SHARMAN REGISTERED 26795 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	CVS/MAS
CHECKED BY:	CVS
SHEET NO.	F-1-101
REVISION	△



1 F-1-102

FIRE PROTECTION PLAN

SCALE: 1/8" = 1'-0"

0' 4' 8' 16' 24'

SCALE: 1" = 8'

GENERAL NOTES:

1. DO NOT INSTALL ANY PIPE OVER ANY ELECTRICAL EQUIPMENT.

SHEET KEYNOTES:

1. SEE SITE UTILITY PLAN FOR CONTINUATION.
2. FIRE ALARM CHECK VALVE ASSEMBLY. SEE DETAIL, SHEET F-500.
3. MAIN DRAIN
4. ELECTRIC ALARM
5. SPRINKLER PIPE TO SPRINKLERS.
6. SPRINKLER INSPECTOR'S TEST STATION. SEE DETAIL, SHEET F-500.
7. PROVIDE SIDEWALL SPRINKLER HEAD FEEDING THIS ROOM.
8. PROVIDE 5" STORZ CONNECTION ON THE BUILDING PER CHARLESTON FIRE DEPARTMENT. INSTALL PER THEIR REQUIREMENTS.

HAZARD CLASSIFICATION

USE CLASSIFICATION REQUIRED BY CODE, BUT NO LESS THAN:

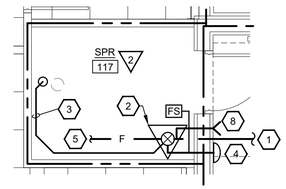
1. LIGHT HAZARD - VESTIBULES, CORRIDORS, OFFICES, BREAK ROOM, RESTROOMS & SHOWER.
2. ORDINARY HAZARD (GROUP 1) - MECHANICAL/ELECTRICAL ROOMS, SPRINKLER ROOM, SECURITY ROOM & JANITOR ROOM.
3. ORDINARY HAZARD (GROUP 2) - SURPLUS STORAGE, GROUND STORAGE, PESTICIDE STORAGE, CARPENTRY SHOP/STORAGE, WELDING & MAINTENANCE SHOP.

FIRE FLOW TEST

SEE SHEET F-001 FOR FLOW TEST INFORMATION AND FLOW GRAPH.

FIRE SUPPRESSION SPECIAL NOTE

THE FIRE SUPPRESSION CONTRACTOR SHALL CONDUCT A SEPARATE FLOW TEST FOR USE IN SHOP DRAWING/HYDRAULIC CALCULATIONS. THE TEST SHALL BE FULLY COORDINATED WITH THE OWNER, UTILITY COMPANY, AND WITNESSED BY THE ARCHITECT/ENGINEER.



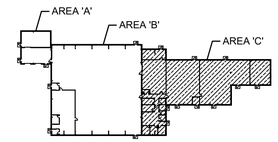
2 F-1-102

ENLARGED SPRINKLER ROOM FIRE PROTECTION PLAN

SCALE: 1/4" = 1'-0"

0' 4' 8' 16'

SCALE: 1" = 4'



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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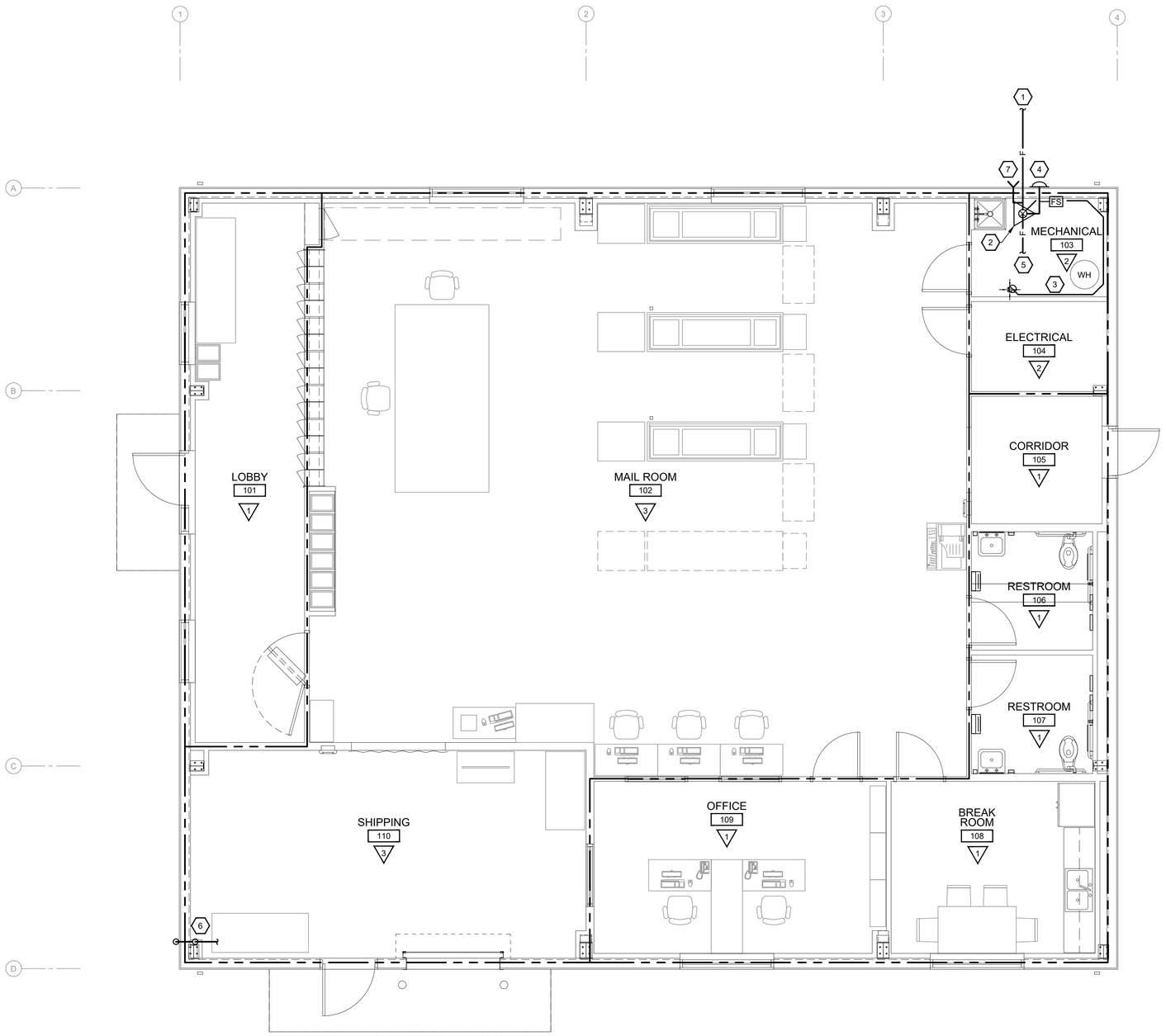
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www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREA "C"
FIRE PROTECTION PLAN

CORY SHARRARD REGISTERED 26722 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/9/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	CVS/MAS
CHECKED BY:	CVS
SHEET NO.	F-1-102
REVISION	



1 F-3-101 **FIRE PROTECTION PLAN**

SCALE: 1/4" = 1'-0"

0' 2' 4' 8' 12'

SCALE: 1" = 4'

GENERAL NOTES:

1. DO NOT INSTALL ANY PIPES ABOVE ANY ELECTRICAL EQUIPMENT.

SHEET KEYNOTES:

1. SEE SITE UTILITY PLAN FOR CONTINUATION.
2. FIRE ALARM CHECK VALVE ASSEMBLY. SEE DETAIL, SHEET F-500.
3. MAIN DRAIN
4. ELECTRIC ALARM
5. SPRINKLER PIPE TO SPRINKLERS.
6. SPRINKLER INSPECTOR'S TEST STATION. SEE DETAIL, SHEET F-500.
7. PROVIDE 5" STORZ CONNECTION ON THE BUILDING PER CHARLESTON FIRE DEPARTMENT. INSTALL PER THEIR REQUIREMENTS.

HAZARD CLASSIFICATION

USE CLASSIFICATION REQUIRED BY CODE, BUT NO LESS THAN:

1. LIGHT HAZARD - LOBBY, CORRIDOR, OFFICE, BREAK ROOM & RESTROOMS.
2. ORDINARY HAZARD (GROUP 1) - MECHANICAL ROOM, ELECTRICAL ROOM, STORAGE & STORAGE ROOM
3. ORDINARY HAZARD (GROUP 2) - MAILROOM & SHIPPING.

FIRE FLOW TEST

SEE SHEET F-001 FOR FLOW TEST INFORMATION AND FLOW GRAPH.

FIRE SUPPRESSION SPECIAL NOTE

THE FIRE SUPPRESSION CONTRACTOR SHALL CONDUCT A SEPARATE FLOW TEST FOR USE IN SHOP DRAWING/HYDRAULIC CALCULATIONS. THE TEST SHALL BE FULLY COORDINATED WITH THE OWNER, UTILITY COMPANY, AND WITNESSED BY THE ARCHITECT/ENGINEER.

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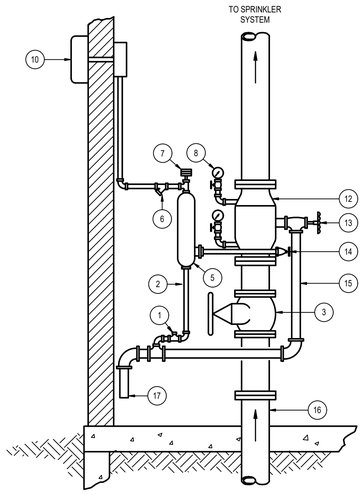
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1

FIRE PROTECTION PLAN

CORY SHARRARD REGISTERED 28726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

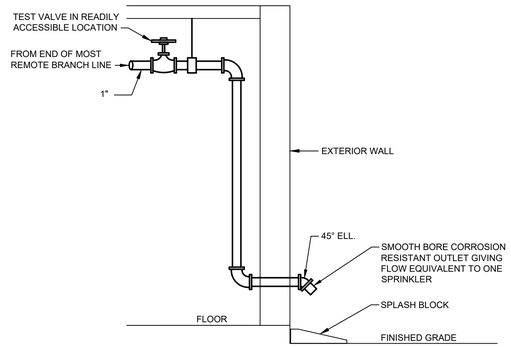
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	CVS/MAS
CHECKED BY:	MAS
SHEET NO.	REVISION
F-3-101	



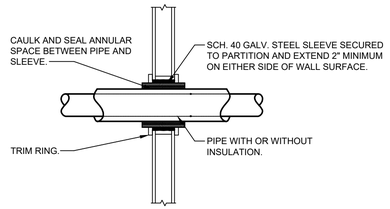
ITEM	DESCRIPTION
1	CHECK VALVE
2	RETARDING CHAMBER DRAIN
3	MAIN SHUTOFF W/TAMPER SW.
4	NOT USED
5	RETARDING CHAMBER
6	ALARM LINE STRAINER
7	PRESSURE SWITCH
8	WATER GAUGE (2 REQUIRED)
9	NOT USED
10	WATER MOTOR ALARM
11	NOT USED
12	WET PIPE ALARM VALVE
13	MAIN DRAIN VALVE
14	ALARM TEST VALVE
15	MAIN DRAIN
16	RISER FROM MAIN WATER SUPPLY
17	TO FLOOR DRAIN

NOTE: ALARM MAY BE ELECTRIC IN LIEU OF WATER MOTOR.

1 FIRE ALARM PIPING DETAIL
NOT TO SCALE

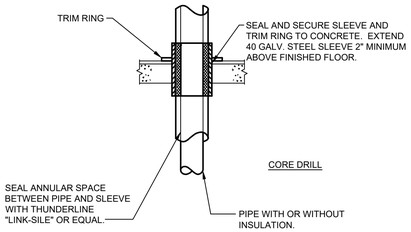


2 SPRINKLER INSPECTOR TEST STATION DETAIL
NOT TO SCALE



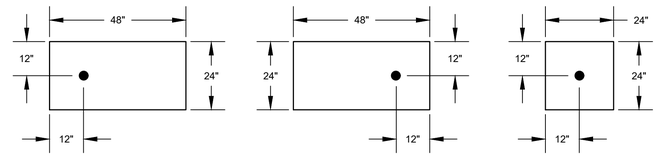
NOTES:
1. TYPICAL FOR NON-INSULATED PIPE AND CONDUIT.
2. ALL CAULKING AND SEALANT SHALL BE FIRE RATED (SEE SPECIFICATIONS).

4 TYPICAL PIPE PENTRATION THRU INTERIOR WALLS
NOT TO SCALE



NOTES:
1. TYPICAL FOR NON-INSULATED PIPE AND CONDUIT.
2. FOR FLOOR PENETRATIONS WITH FIRE RATING GREATER THAN (1) HOUR, USE THUNDERLINE "PYPRO-PAC" SEALS OR EQUAL.

5 TYPICAL PIPE PENTRATION THRU CONCRETE SLAB
NOT TO SCALE



3 HEAD PLACEMENT IN ACCOUSTICAL TILE DETAIL
NOT TO SCALE

REVISION NUMBER	REVISIONS	DATE	BY

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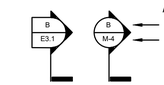
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

FIRE PROTECTION DETAILS

CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	CVS
CHECKED BY:	CVS
SHEET NO.	REVISION
F-500	△

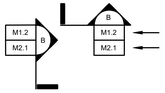
GENERAL LEGEND



APPEARS ON SHEET WHERE SECTION IS CUT
SECTION IDENTIFICATION LETTER
SHEET WHERE SECTION IS DRAWN



APPEARS ON THE SHEET WHERE SECTION IS DRAWN
SECTION OR DETAIL IDENTIFICATION LETTER
SHEET WHERE DRAWN



SECTION SYMBOL ON SHEET WHERE CUT
SHEET WHERE SECTION IS CUT
SHEET WHERE SECTION IS DRAWN



ELEVATION SYMBOL ON SHEET WHERE INDICATED
SHEET WHERE INDICATED
SHEET WHERE DRAWN



SECTION, ELEVATION OR DETAIL IDENTIFICATION
ON SHEET WHERE DRAWN
SHEET WHERE INDICATED OR CUT
SHEET WHERE DRAWN



ENLARGED AREA OR PARTIAL PLAN SYMBOL
(ON SHEET WHERE INDICATED AND SHEET WHERE DRAWN)
IDENTIFICATION LETTER
SHEET WHERE DRAWN



PLAN MATCH LINE SYMBOL



ROOM NUMBER



CEILING HEIGHT, mm

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
TOS, BOS	TOP OF STEEL, BOTTOM
TOB, BOB	TOP OF BEAM, BOTTOM
TOJ, BOJ	TOP OF JOIST, BOTTOM
TOC, BOC	TOP OF CONCRETE, BOTTOM
TOP, BOP	TOP OF PIPE, BOTTOM

PLUMBING EQUIPMENT TAG

PLUMBING LEGEND

R	SAFETY OR RELIEF VALVE DISCHARGE PIPING
CD	CONDENSATE DRAIN PIPING
G	NATURAL GAS PIPING
S	EXISTING SANITARY SEWER PIPING (SITE)
SS	EXISTING STORM SEWER PIPING
S	SANITARY SEWER PIPING (SITE)
SS	STORM SEWER PIPING
	SOIL & WASTE PIPING
	DWV VENT PIPING
RL	ROOF LEADER PIPING
FD	FOUNDATION DRAIN PIPING
	DOMESTIC COLD WATER PIPING
	DOMESTIC HOT WATER PIPING
	DOMESTIC RECIRCULATING HOT WATER PIPING
TPS	TEPID EMERGENCY FIXTURE WATER PIPING
W	WATER SERVICE PIPING (EXTERIOR)
	VALVE (IN GENERAL - SEE SPECS)
	GATE VALVES (GV)
	GLOBE VALVES
	CHECK VALVE
	BALANCING VALVE (WITH READ OUT)
	BALANCING COCK ONLY (NON-SHUTOFF)
	HOSE CONNECTION, BOILER DRAIN
	BALL VALVES (BV)
	PLUG COCKS, BALANCING COCKS
	SILENT CHECK VALVE
	BUTTERFLY VALVES (BFV)
	CONTROL VALVE; TWO WAY, THREE WAY
	SOLENOID OR QUICK-OPENING VALVE
	MOTOR OPERATED VALVE
	FLOW MEASURING DEVICE
	SELF REGULATING FLOW CONTROL VALVE
	RELIEF VALVE; PLAN, ELEVATION
	PRESSURE REDUCING VALVE (PRV)
	STRAINER; STRAINER WITH BLOW DOWN.
	FLEXIBLE CONNECTOR
	BACKFLOW PREVENTER, REDUCED PRESSURE PRINCIPLE (WITH STRAINER)
	BACKFLOW PREVENTER, REDUCED PRESSURE PRINCIPLE (WITH STRAINER)
	DOUBLE CHECK VALVE ASSEMBLY (DCA)
	REDUCING BUSHING
	COUPLING, JOINT

	CAP
	PLUG
	90° ELBOW
	90° ELBOW TURNED UP
	90° ELBOW TURNED DOWN
	45° ELBOW
	TEE OR SIDE CONNECTION
	TEE OUTLET UP
	TEE OUTLET DOWN
	CROSS
TOP / BOT	UNCONNECTED CROSSING PIPES
	RISE OR DROP IN PIPE
	BOTTOM CONNECTION TO LINE
	TOP CONNECTION TO LINE
	RISER IN SLEEVE
	UNION
	STRUCTURAL PIPE ANCHOR
	BUILDING ENTRANCE PIPE ANCHOR
	PIPE GUIDE
	EXPANSION JOINT
	THRUST BLOCK
	WALL SLEEVE
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
VTR / VTR	VENT THROUGH ROOF, PLAN & RISER
	THROUGH ROOF
	THROUGH FLOOR
	THROUGH WALL
	THERMOMETERS
	THERMOMETER WELL

P /	PRESSURE GAUGES
V / C	VACUUM AND COMPOUND GAUGES
PT	PRESSURE/TEMPERATURE TEST PLUG
FS	FLOW SWITCH
	ORIFICE FLOW METER
M	METER: WATER, CONDENSATE OR GAS
WHA-A	WATER HAMMER ARRESTOR: PDI SIZE A
P-1	PLUMBING FIXTURE I.D. NUMBER
VTR	VENT THRU ROOF; PLAN & RISER
FD-1	FLOOR DRAIN I.D. NUMBER; PLAN & RISER
CO	CLEAN OUT
FCO	FLOOR CLEAN OUT
GCO	GRADE CLEAN OUT
PCO	PIPE CLEAN OUT
WCO	WALL CLEAN OUT
AD	ACCESS DOOR
WH	WALL HYDRANT
HB	HOSE BIBB
OR	OPEN RECEPTACLE

PLUMBING GENERAL NOTES:

1. GENERAL NOTES, WHEREVER THEY ARE FOUND, APPLY TO ALL WORK IN THE PROJECT, UNLESS OTHERWISE INDICATED. SHEET NOTES, UTILIZING NOTE SYMBOLS, APPLY ONLY TO THE SHEET ON WHICH THEY ARE FOUND, UNLESS OTHERWISE STATED. THE MEANING OF NOTE SYMBOLS AND NUMBERS VARIES FROM SHEET TO SHEET.
2. CONTRACTOR SHALL UTILIZE ALL INFORMATION IN THE CONTRACT DOCUMENTS FOR PROVIDING THE WORK. CONTRACTOR SHALL UTILIZE DETAILS AND FLOW DIAGRAMS FOR THE WORK WHERE APPROPRIATE, WHETHER OR NOT THEY ARE SPECIFICALLY REFERENCED ON THE PLANS OR SUPPORTING DRAWINGS.
3. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONTRACT DOCUMENTS ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ANY WORK RELATING TO THOSE CONDITIONS IS PERFORMED.
4. LEGENDS OR LISTS OF SYMBOLS AND ABBREVIATIONS ARE GENERAL IN NATURE AND MAY CONTAIN ITEMS NOT USED IN THE CONTRACT DOCUMENTS. IF ANY SUCH ITEMS ARE FOUND WHICH ARE NOT DEFINED ON THE PLANS OR IN THE SPECIFICATIONS, THE ENGINEER SHALL BE CONTACTED FOR CLARIFICATION.
5. CONTRACTOR SHALL MAINTAIN A SET OF PROJECT RECORD DRAWINGS AT THE JOB SITE AND SHALL BE RESPONSIBLE FOR MAKING CLEAR, NEAT CHANGES TO THE DRAWINGS, REFLECTING CHANGES TO THE WORK AND VARIANCE IN EXISTING CONDITIONS.
6. PROVIDE ALL MISCELLANEOUS STEEL, AS REQUIRED, TO SUPPORT ALL PIPING SYSTEMS AND EQUIPMENT. HANG ALL EQUIPMENT FROM STRUCTURE WITH MINIMUM OF TWO TRAPEZE ASSEMBLIES OR FOUR INTEGRAL MOUNTING POINTS WITH VIBRATION ISOLATORS ON ALL FOUR SUPPORTS. DO NOT HANG ANYTHING FROM STEEL, COMPOSITION OR WOODEN DECKS. NON-ROOF CONCRETE DECKS MAY BE USED ONLY WITH PERMISSION OF THE ENGINEER. DO NOT HANG ANYTHING FROM MECHANICAL OR ELECTRICAL ITEMS.
7. NO CONCRETE RIBS OR JOISTS SHALL BE CUT WITHOUT SPECIFIC PERMISSION FROM THE ENGINEER. ALL ROOF OR FLOOR DECK PENETRATIONS IN WAFFLE STRUCTURE SHALL BE IN THE THIN-SLAB DEPRESSIONS IN THE STRUCTURE UNLESS OTHERWISE SHOWN.
8. CONSULT ROOF PLAN AND STRUCTURAL DRAWINGS FOR PLACEMENT OF ROOF MOUNTED EQUIPMENT. PROVIDE ALL NECESSARY ROOF CURBS, EQUIPMENT RAILS AND BASES AND ANY ADDITIONAL REQUIRED FRAMING IN COORDINATION WITH STRUCTURAL AND ROOFING WORK.
9. ALL EQUIPMENT, ACCESSORIES, PIPING, WIRING, DUCT AND OTHER WORK, WHICH IS INSTALLED IN FINISHED SPACES SHALL BE CONCEALED IN WALLS, FLOORS, FURRED CHASES OR SUSPENDED CEILINGS, EXCEPT FOR INDICATED TERMINAL UNITS, CONTROLS, AIR INLETS AND OUTLETS, AS SHOWN.
10. DO NOT CHANGE PATH OF PIPING OR CHANGE PIPE SIZE WITHOUT FIRST CONSULTING THE ENGINEER. PIPE SIZES SHOWN ON DRAWINGS ARE NOMINAL UNLESS OTHERWISE INDICATED.
11. SEE ALSO RISER DIAGRAMS FOR SIZES NOT SHOWN ON PLANS.
12. FOR TYPICAL WATER, REFRIGERANT AND AIR CONNECTIONS TO EQUIPMENT, SEE STANDARD DETAILS.
13. ALL COPPER PIPING SHALL BE ASSEMBLED WITH WROUGHT COPPER OR CAST COPPER ALLOY FITTINGS AND 95/5 TIN ANTIMONY SOLDER OR SILVER BRAZING. NO SOLDER CONTAINING LEAD SHALL BE USED.
14. ALL PIPING, FITTINGS, FIXTURES AND EQUIPMENT IN CONTACT WITH POTABLE WATER SHALL BE CERTIFIED BY THE SOURCE OF THE PRODUCT TO CONTAIN LESS THAN 0.25% LEAD IN COMPLIANCE WITH THE EPA AND SDWA (SAFE DRINKING WATER ACT). NO SOLDER CONTAINING MORE THAN 0.2% LEAD SHALL BE USED IN MANUFACTURING OR IN FIELD ASSEMBLY OF POTABLE WATER SYSTEM COMPONENTS.
15. REDUCED SIZE TAKE-OFFS FROM WELDED PIPING MORE THAN ONE SIZE LOWER THAN MAIN MAY BE MADE WITH WELD-O-LETS. FULL-SIZE TAKE-OFFS AND ONE SIZE LOWER SHALL BE MADE WITH TEES.
16. ALL CHECK VALVES IN PUMP DISCHARGES SHALL BE SPRING-LOADED OR SILENT TYPE OR FOR LARGE WASTE: LEVER-WEIGHTED TYPE.
17. ALL EXTERIOR MECHANICAL UTILITIES SHALL BE IN GENERAL COMPLIANCE WITH APPROPRIATE MECHANICAL DIVISION SPECIFICATION SECTION (FOR CORRESPONDING INTERIOR UTILITIES).
18. CONTRACTOR SHALL CERTIFY AT THE TIME OF OWNER OCCUPANCY THAT ALL BELT-DRIVEN EQUIPMENT HAS BEEN CHECKED FOR BELT TIGHTNESS AFTER WEAR-IN PERIOD.
19. ALL EXISTING EQUIPMENT SHUTDOWNS OR INTERRUPTIONS OF UTILITY SERVICE REQUIRED FOR COMPLETION OF THE WORK SHALL BE SCHEDULED IN ADVANCE, AS REQUIRED BY THE OWNER.
20. COORDINATE ALL PIPING AND DUCTWORK WITH BOTH NEW AND EXISTING MECHANICAL AND ELECTRICAL WORK, INCLUDING HVAC, PLUMBING, ELECTRICAL, FIRE ALARM, SPRINKLER AND COMMUNICATIONS.
21. CONTRACTOR IS RESPONSIBLE FOR MAKING ALL REQUIRED CONNECTIONS FOR A COMPLETE SYSTEM.
22. DO NOT USE BULL-HEADED TEE FITTINGS, EITHER ON PIPE OR ON DUCT, UNLESS SPECIFICALLY SHOWN.
23. CONTRACTOR SHALL MAKE MINOR OFFSETS AND LOCATION CHANGES IN PIPE AND DUCT AND IN DUCT ASPECT RATIO AS REQUIRED IN CONGESTED CEILING OR MECHANICAL SPACES. GENERALLY, THESE WILL BE AT NO COST TO THE OWNER AND APPROVED BY THE ENGINEER WITHOUT FORMAL DOCUMENTS. MAJOR REROUTING OF LINES OR MAJOR ADDITION OF FITTINGS WILL BE REVIEWED AND APPROVED AS A CHANGE ORDER OR A FORMAL DIRECTIVE. ENGINEER ALONE SHALL CLASSIFY CHANGES AS MAJOR OR MINOR.
24. PROVIDE DISCONNECTS AND MAGNETIC STARTERS (OR RELAYS WITH OVERLOAD PROTECTION FOR SINGLE PHASE) FOR ALL EQUIPMENT SUPPLIED UNDER MECHANICAL DIVISION WHICH IS SPECIFIED TO HAVE FACTORY CONTROL PANEL. POWER WIRING AND CONDUIT TO THESE DEVICES AND BETWEEN THESE DEVICES AND MECHANICAL EQUIPMENT, IF REQUIRED, SHALL BE SUPPLIED UNDER ELECTRICAL DIVISION. SEE MECHANICAL SECTION OF THE SPECIFICATIONS.
25. PROVIDE ALL ACCESS DOORS AS SHOWN, EXCEPT THOSE SPECIFIED UNDER OTHER DIVISIONS. IN ADDITION, PROVIDE ANY OTHER ACCESS DOORS - WHETHER OR NOT SHOWN ON PLANS - NECESSARY FOR ACCESS TO CONCEALED EQUIPMENT, VALVES, DAMPERS, ACTUATORS, JUNCTION BOXES, CONTROLS OR OTHER OPERATIONAL OR SERVICABLE ITEMS. UNLESS ITEM IS REASONABLY ACCESSIBLE THROUGH LAY-IN CEILING PANELS.
26. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM CONFORMING TO ALL REQUIREMENTS OF THE CURRENT BUILDING CODES OF WEST VIRGINIA:

    2015 INTERNATIONAL BUILDING CODE
    2015 WEST VIRGINIA STATE BUILDING CODE
    2015 INTERNATIONAL FUEL GAS CODE
    2015 INTERNATIONAL MECHANICAL CODE
    2015 INTERNATIONAL PLUMBING CODE
    2015 EDITION OF THE NATIONAL FIRE CODES
    2010 EDITION OF ASHRAE STANDARD 90.1

CONTRACTOR IS RESPONSIBLE FOR MAKING ALL REQUIRED CONNECTIONS FOR A COMPLETE SYSTEM.

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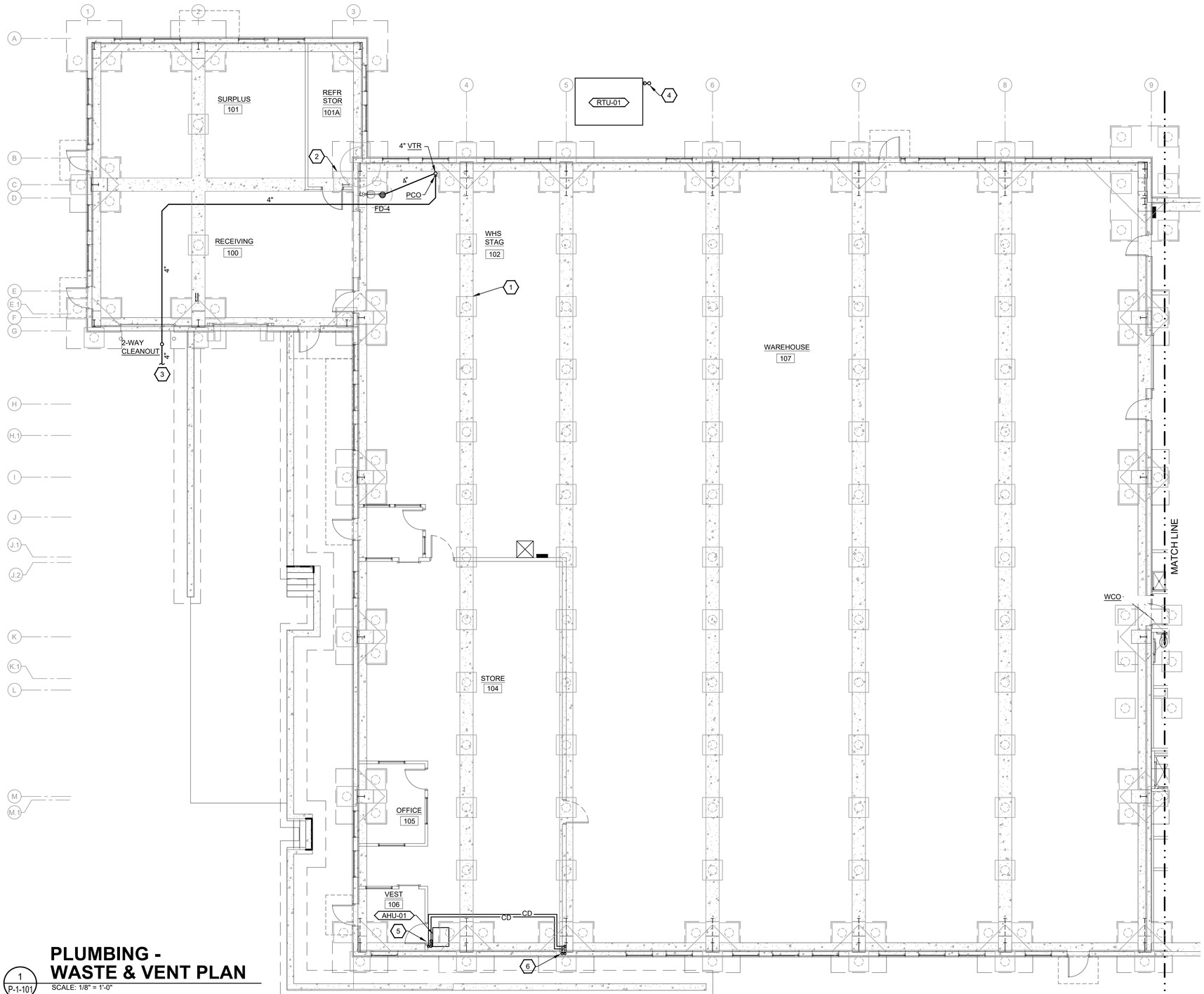
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

PLUMBING
LEGENDS AND GENERAL NOTES

CORY V. SHARRARD
REGISTERED
26772
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	CVS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-001	



PLUMBING - WASTE & VENT PLAN

1 / P-1-101

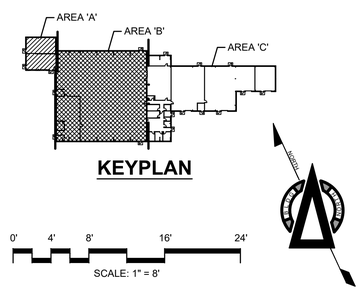
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT AND SPECIALTIES DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.

SHEET KEYNOTES:

1. GRADE BEAM (TYPICAL).
2. PIER(S) AND FOOTING. SEE STRUCTURAL PLANS AND DETAILS.
3. SEE SITE UTILITIES PLAN FOR CONTINUATION.
4. TRAPPED CONDENSATE DRAIN PIPE AT RTU CONDENSATE DISCHARGE OUTLET. CONDENSATE PIPE SIZE TO MATCH UNIT DISCHARGE SIZE.
5. PRIMARY AND SECONDARY TRAPPED CONDENSATE DRAIN PIPES AT AHU CONDENSATE DISCHARGE OUTLETS. CONDENSATE PIPE SIZES TO MATCH UNIT DISCHARGE SIZES.
6. PRIMARY AND SECONDARY CONDENSATE PIPES DOWN IN WALL TO 12" AFG. EXTEND THROUGH WALL AND ELL DOWN. SEAL WALL PENETRATION WATER AND AIR TIGHT.



KEYPLAN

0' 4' 8' 16' 24'

SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

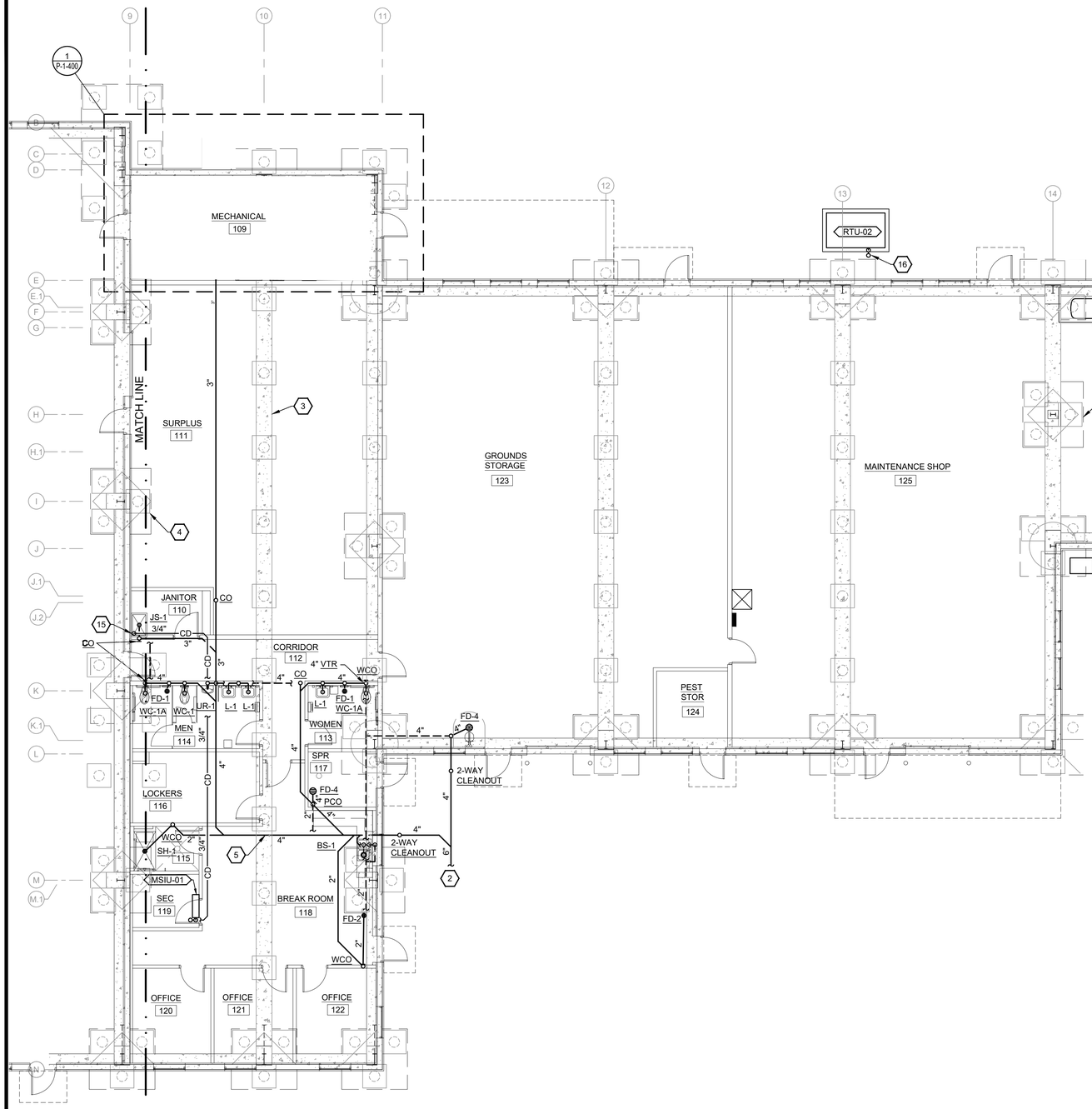
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREAS "A" & "B"
PLUMBING
WASTE & VENT PLAN

CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
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SHEET NO.	P-1-101
REVISION	△



2 P-1-102 PLUMBING - WASTE & VENT PLAN

SCALE: 1/8" = 1'-0"

1 P-1-102 PHASE 1 - PLUMBING - WASTE & VENT PLAN

SCALE: 1/8" = 1'-0"

KEYPLAN

0' 4' 8' 16' 24'

SCALE: 1" = 8'

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT AND SPECIALTIES DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.
6. SEE SHEET G-003 FOR CONSTRUCTION PHASING.
7. SEE SHEET A-1-701 FOR EQUIPMENT SCHEDULE ITEMS.

⬡ SHEET KEYNOTES:

1. EXTEND TO OIL/WATER SEPARATOR. SEE SITE UTILITIES PLAN FOR CONTINUATION.
2. SEE SITE UTILITIES PLAN FOR CONTINUATION.
3. GRADE BEAM (TYPICAL). DO NOT INSTALL ANY WASTE PIPE THROUGH OR UNDER ANY INTERIOR GRADE BEAMS EXCEPT AS NOTED.
4. PIER(S) AND FOOTING. SEE STRUCTURAL PLANS AND DETAILS.
5. WASTE PIPE UNDER INTERIOR GRADE BEAM.
6. OWNER PROVIDED AIR COMPRESSOR (EQUIPMENT SCHEDULE NUMBER ME24). INSTALL PER MANUFACTURER'S CLEARANCE REQUIREMENTS. PROVIDE DRAIN PIPE TO OPEN RECEPTACLE. REMOVE AND RETURN TO OWNER UNDER PHASE 2.
7. 4" INTAKE AND 4" VENT PIPE TO CONCENTRIC VENT. REMOVE UNDER PHASE 2.
8. 4" CONCENTRIC VENT KIT. REMOVE UNDER PHASE 2 AND PATCH WALL TO MATCH CONSTRUCTION AND FINISH.
9. WATER HEATER (EQUIPMENT SCHEDULE NUMBER ME28) PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO OPEN RECEPTACLE. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO OPEN RECEPTACLE. PROVIDE TRAPPED PRIMARY AND SECONDARY CONDENSATE PIPES AND EXTEND TO OPEN RECEPTACLE. INSTALL WATER HEATER ON EIGHT 8"x16"x4" SOLID CONCRETE BLOCKS. REMOVE WATER HEATER AND INSTALL IN MECHANICAL ROOM ON POURED CONCRETE PAD UNDER PHASE 2.
10. REMOVE OPEN RECEPTACLE FUNNEL TO FLUSH WITH FINISHED FLOOR.
11. PROVIDE FLOOR DRAIN UNDER PHASE 1 IF SLAB IS POURED IN THIS AREA. PROVIDE CAPPED STUB-UP IF SLAB IS NOT POURED IN PHASE 1. COMPLETE FLOOR DRAIN INSTALLATION UNDER PHASE 2. PROVIDE 1/2" TRAP PRIMER PIPE FROM INLET SIDE OF P-TRAP, EXTEND TO WALL AS REQUIRED AND CAP UNDER PHASE 1. REMOVE CAP AND COMPLETE INSTALLATION UNDER PHASE 2.
12. PROVIDE 3" VENT PIPE THROUGH WALL AND CAP UNDER PHASE 1. REMOVE CAP AND INSTALL 3" VENT PIPE CONTINUATION UNDER PHASE 2.
13. PROVIDE 3" VENT UP TO ABOVE FINISHED FLOOR AND CAP UNDER PHASE 1. REMOVE CAP AND INSTALL 3" VENT PIPE CONTINUATION UNDER PHASE 2.
14. NEW OWNER PROVIDED AIR COMPRESSOR (EQUIPMENT SCHEDULE NUMBER WD-1) MOUNTED ON CONCRETE PAD. INSTALL PER MANUFACTURER'S CLEARANCE REQUIREMENTS. PROVIDE DRAIN PIPE TO FLOOR DRAIN.
15. 3/4" CONDENSATE PIPE DOWN TO JANITOR SINK.
16. TRAPPED CONDENSATE DRAIN PIPE AT RTU CONDENSATE DISCHARGE OUTLET. CONDENSATE PIPE SIZE TO MATCH UNIT DISCHARGE SIZE.

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GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREA "C"
PLUMBING
WASTE & VENT PLANS

CORY SHARRARD REGISTERED 26755 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

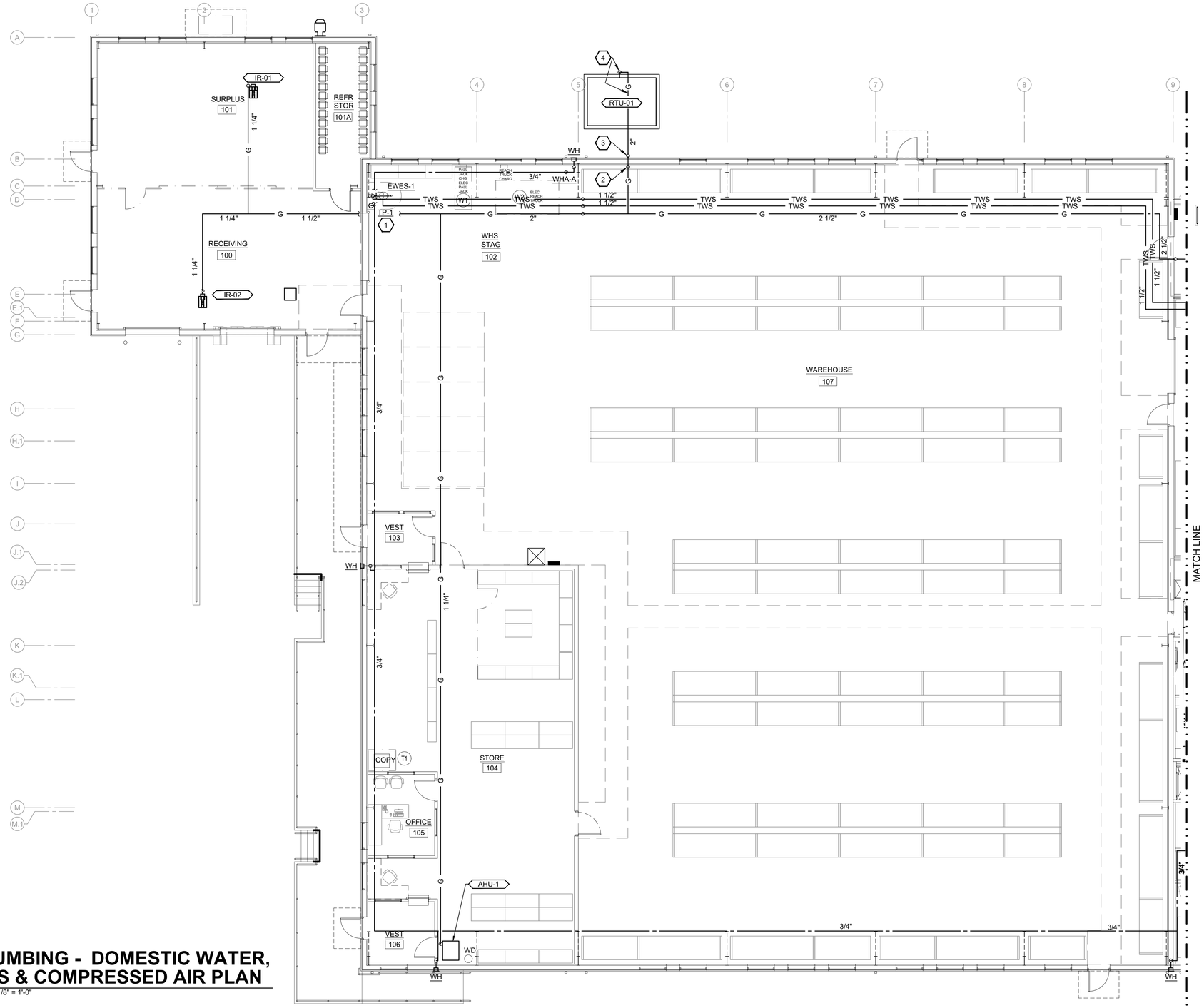
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SHEET NO.	REVISION
P-1-102	

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT AND SPECIALTIES DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.

SHEET KEYNOTES:

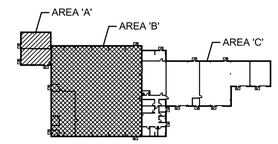
1. MOUNT TRAP PRIMER AS CLOSE TO DCW MAIN PIPE ELEVATION AS POSSIBLE. EXTEND 1/2" DCW DOWN AT WALL TO BELOW SLAB AND INTO INLET SIDE OF FLOOR DRAIN TRAP.
2. GAS PIPE THROUGH WALL. ELEVATION TO MATCH DUCT ELEVATION.
3. GAS PIPE DOWN BESIDE DUCT TO ABOVE RTU.
4. GAS PIPE ABOVE RTU AND DOWN TO GAS INLET ON UNIT.



PLUMBING - DOMESTIC WATER, GAS & COMPRESSED AIR PLAN

1 / P-1-103

SCALE: 1/8" = 1'-0"



KEYPLAN

0' 4' 8' 16' 24'

SCALE: 1" = 8'

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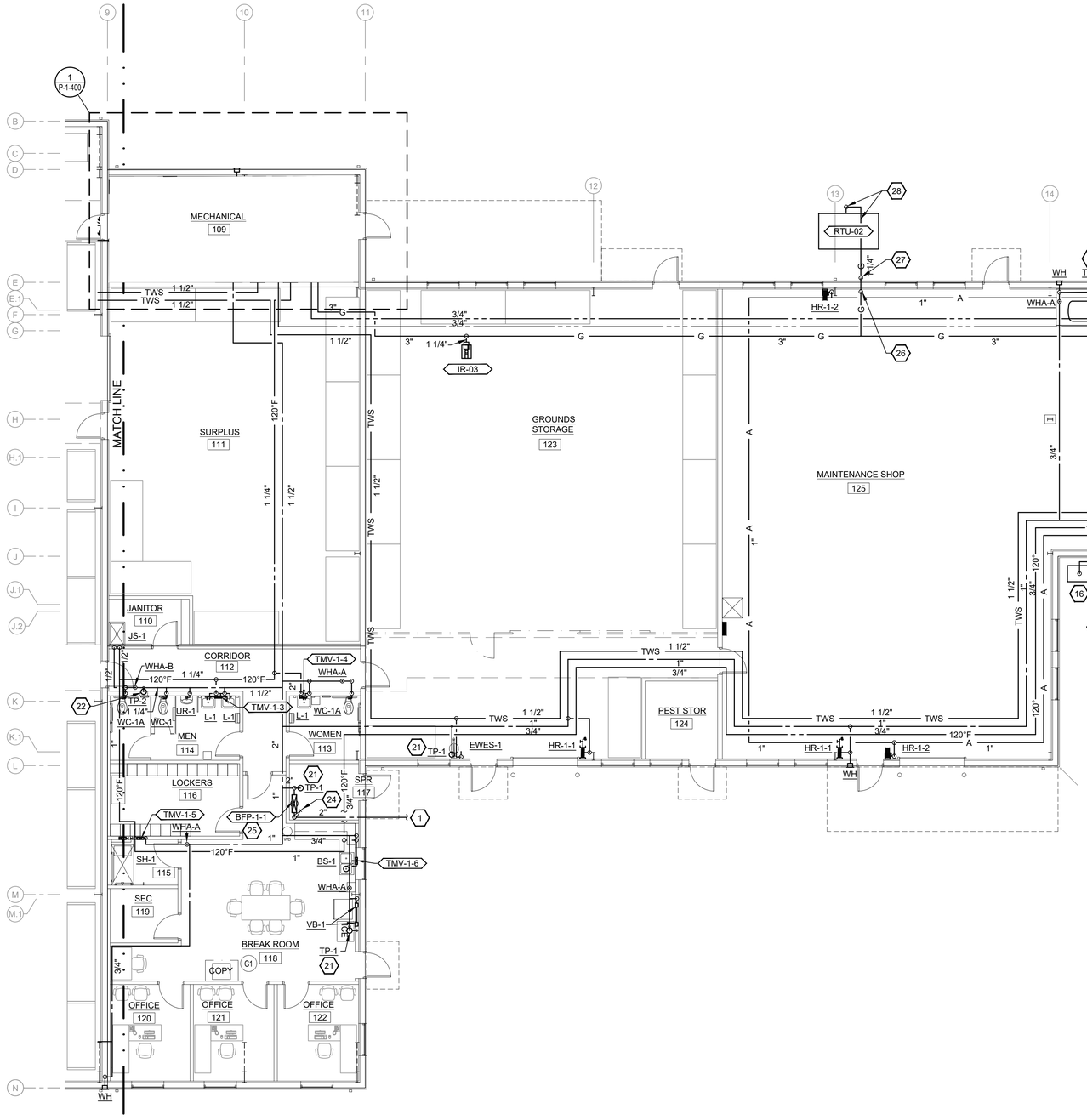
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WAREHOUSE - AREAS "A" & "B"
PLUMBING
DOMESTIC WATER, GAS & COMPRESSED AIR PLAN

CORY SHARRARD REGISTERED 26776 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 6/6/21

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CHECKED BY:	CVS
SHEET NO.	P-1-103
REVISION	△



2 P-1-104 PLUMBING - DOMESTIC WATER, GAS & COMPRESSED AIR PLAN

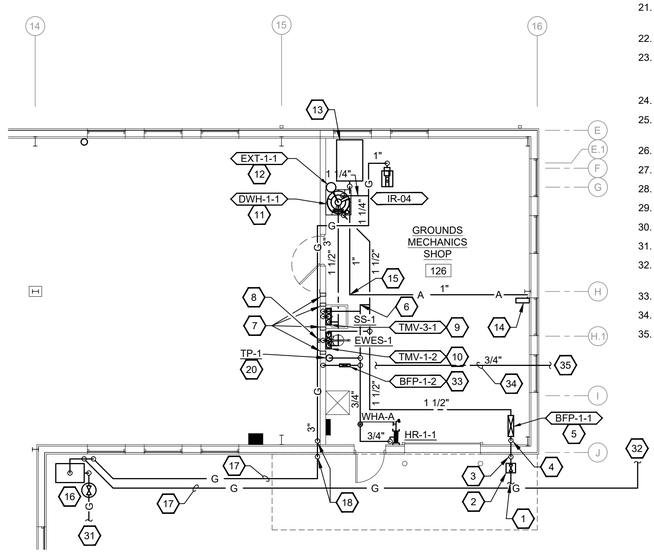
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT AND SPECIALTIES DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.
6. SEE SHEET G-003 FOR CONSTRUCTION PHASING.
7. SEE SHEET A-1-700 FOR EQUIPMENT SCHEDULE ITEMS.

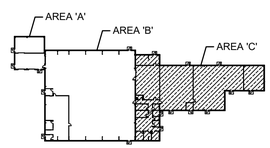
SHEET KEYNOTES:

1. SEE SITE UTILITIES PLAN FOR CONTINUATION.
2. PROVIDE VALVE BOX WITH 2" SHUT-OFF VALVE UNDER PHASE 1 FOR TEMPORARY SERVICE TO GROUNDS MECHANICS SHOP 126. CAP OUTGOING PIPE FROM VALVE UNDER PHASE 2 AND ABANDON VALVE BOX.
3. PROVIDE 2" DOMESTIC WATER PIPE TO 12" ABOVE GRADE AND INTO GROUND MECHANICS SHOP 126 UNDER PHASE 1. CAP PIPE BELOW GRADE AND REMOVE PIPE ABOVE GRADE UNDER PHASE 2. PATCH WALL TO MATCH CONSTRUCTION AND FINISH UNDER PHASE 2.
4. PROVIDE 2" DOMESTIC WATER PIPE UP TO 7'-6' AFF UNDER PHASE 1. REMOVE PIPE UNDER PHASE 2.
5. INSTALL BACKFLOW PREVENTER WITH STRAINER AT 7'-6" AFF UNDER PHASE 1. PROVIDE AIR GAP FITTING AND DRAIN PIPE DOWN AT WALL AND SPILL TO FLOOR UNDER PHASE 1. REMOVE BACKFLOW PREVENTER AND INSTALL IN SPRINKLER ROOM 117 UNDER PHASE 2. INSTALL PER MANUFACTURER'S RECOMMENDATIONS UNDER PHASE 2.
6. POINT OF CONNECTION TO DOMESTIC WATER PIPE UNDER PHASE 2. REMOVE ALL UPSTREAM DOMESTIC WATER PIPE SERVING THE BACKFLOW PREVENTER AND WATER HEATER UNDER PHASE 2. PROVIDE CONNECTION TO 1" DOMESTIC WATER PIPE AT THIS POINT AS NOT TO REVERSE THE DIRECTION OF WATER FLOW FROM PHASE 1 TO PHASE 2.
7. PROVIDE CAPPED SLEEVE IN WALL UNDER PHASE 1 TO ACCOMMODATE PHASE 2 PIPE INSTALLATION. SEE PHASE 2 PLAN AND RISER FOR PIPE SIZE.
8. PROVIDE CAPPED 1 1/2" TEPID WATER PIPE AT WALL UNDER PHASE 1. REMOVE CAP AND INSTALL PIPE TO EWES-1 IN MAINTENANCE SHOP 125 UNDER PHASE 2.
9. PROVIDE TMV-3-1 UNDER PHASE 1. REMOVE TEMPERING VALVE UNDER PHASE 2 AND RETAIN FOR INSTALLATION IN MAIL ROOM. INSTALL IN MAIL ROOM MECHANICAL ROOM 103 UNDER ALTERNATE 1. REMOVE ASSOCIATED PIPE AS REQUIRED FOR FINAL CONSTRUCTION UNDER PHASE 2.
10. PROVIDE TMV-1-2 UNDER PHASE 1. REMOVE TEMPERING VALVE AND RETAIN FOR INSTALLATION IN WAREHOUSE MECHANICAL ROOM 109 UNDER PHASE 2. REMOVE ALL ASSOCIATED PIPE AS REQUIRED FOR FINAL CONSTRUCTION UNDER PHASE 2.
11. PROVIDE WATER HEATER (EQUIPMENT SCHEDULE ITEM NUMBER ME28) UNDER PHASE 1. PROVIDE ON EIGHT 8"x16"x4" SOLID CONCRETE BLOCKS. REMOVE WATER HEATER AND ALL RELATED PIPING AS INDICATED UNDER PHASE 2. INSTALL WATER HEATER IN WAREHOUSE MECHANICAL ROOM 109 ON POURED CONCRETE PAD UNDER PHASE 2.
12. PROVIDE EXPANSION TANK UNDER PHASE 1. REMOVE EXPANSION TANK AND INSTALL IN WAREHOUSE MECHANICAL ROOM 109 UNDER PHASE 2.
13. OWNER PROVIDED AIR COMPRESSOR (EQUIPMENT SCHEDULE ITEM NUMBER ME24) PROVIDED UNDER PHASE 1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS. REMOVE AND RETURN TO OWNER UNDER PHASE 2.
14. OWNER PROVIDED COMPRESSED AIR HOSE REEL (EQUIPMENT SCHEDULE ITEM NUMBER ME17) PROVIDED UNDER PHASE 1.
15. REMOVE COMPRESSED AIR PIPE BETWEEN THIS POINT AND AIR COMPRESSOR UNDER PHASE 2 AND CONNECT TO PIPE PROVIDED UNDER PHASE 2.
16. GAS METER AND REGULATOR FOR WAREHOUSE AT THIS LOCATION UNDER PHASE 1. PROVIDE REGULATOR FOR EMERGENCY GENERATOR AT GENERATOR.
17. PROVIDE GAS PIPE BELOW GRADE UNDER PHASE 1.
18. PROVIDE GAS PIPE UP TO 12" AFG AND EXTEND THROUGH WALL INTO MAINTENANCE SHOP 125 UNDER PHASE 1. EXTEND GAS PIPE UP TO BOTTOM OF STRUCTURE AT WALL UNDER PHASE 1.
19. POINT OF CONNECTION TO GAS PIPE PROVIDED UNDER PHASE 1.
20. PROVIDE TRAP PRIMER AND 1/2" DCW PIPES TO ASSOCIATED FLOOR DRAINS UNDER PHASE 1.
21. MOUNT TRAP PRIMER AS CLOSE TO DCW MAIN PIPE ELEVATION AS POSSIBLE. EXTEND 1/2" DCW DOWN AT WALL TO BELOW SLAB AND INTO INLET SIDE OF FLOOR DRAIN TRAP.
22. MOUNT TRAP PRIMER CABINET IN CHASE WALL AT 6'-0" AFF.
23. NEW OWNER PROVIDED AIR COMPRESSOR (EQUPMENT SCHEDULE ITEM NUMBER WD1) MOUNTED ON CONCRETE PAD. INSTALL PER MANUFACTURER'S CLEARANCE REQUIREMENTS.
24. MAIN DOMESTIC WATER SHUT-OFF VALVE.
25. BACKFLOW PREVENTER WITH STRAINER AND AIR GAP FITTING. EXTEND AIR GAP FITTING DRAIN TO FLOOR DRAIN.
26. GAS PIPE THROUGH WALL. ELEVATION TO MATCH DUCT ELEVATION.
27. GAS PIPE DOWN BESIDE DUCT TO ABOVE RTU.
28. GAS PIPE ABOVE RTU AND DOWN TO GAS INLET ON UNIT.
29. 3/4" COMPRESSED AIR DROP TO OWNER PROVIDED BLAST CABINET.
30. OWNER PROVIDED BLAST CABINET (EQUIPMENT SCHEDULE ITEM NUMBER ME10).
31. SEE SITE UTILITIES PLAN FOR CONTINUATION AND SIZE.
32. PROVIDE GAS PIPE TO EMERGENCY GENERATOR UNDER PHASE 1. PROVIDE GAS REGULATOR AT GENERATOR. SEE SITE UTILITIES PLAN FOR CONTINUATION.
33. PROVIDE DOUBLE CHECK VALVE ASSEMBLY UNDER PHASE 1.
34. PROVIDE 3/4" DCW FROM DOUBLE CHECK VALVE ASSEMBLY BELOW SLAB UNDER PHASE 1.
35. 3/4" DCW TO GROUND HYDRANT AT WASH PAD UNDER PHASE 1. SEE SITE UTILITIES PLAN FOR CONTINUATION.



1 P-1-104 PHASE 1 - PLUMBING - DOMESTIC WATER, GAS & COMPRESSED AIR PLANS

SCALE: 1/8" = 1'-0"



KEYPLAN

0' 4' 8' 16' 24'

SCALE: 1" = 8'

REVISION NUMBER	REVISIONS	DATE	BY

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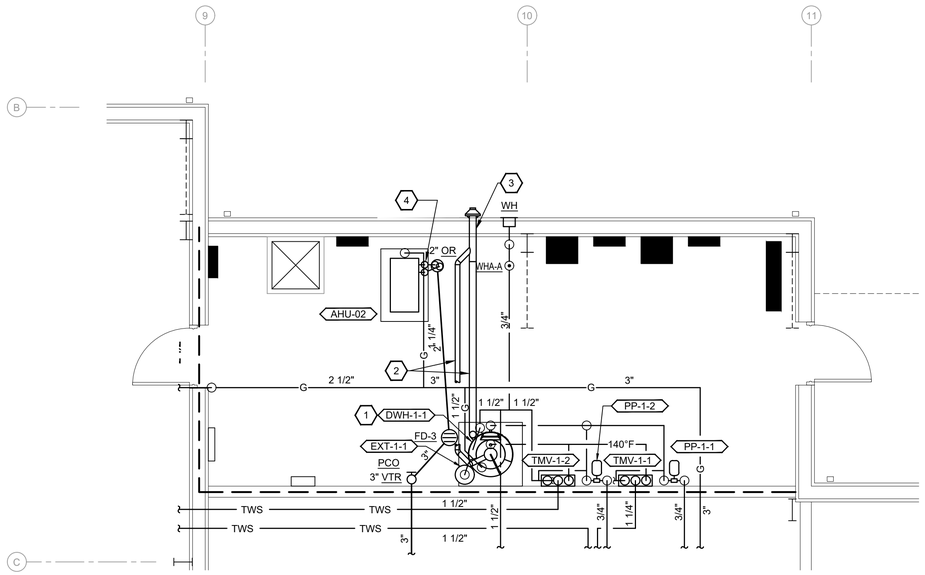
St. Albans, WV (304) 727-5501
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREA "C"
PLUMBING
DOMESTIC WATER, GAS & COMPRESSED AIR PLANS

CORY S. SHARRARD REGISTERED PROFESSIONAL ENGINEER 26725 STATE OF WEST VIRGINIA 9/9/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-1-104	



1
P-1-400

ENLARGED MECHANICAL ROOM 109 PLUMBING PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT AND SPECIALTIES DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.
6. SEE SHEET A-1-701 FOR EQUIPMENT SCHEDULE ITEMS.

SHEET KEYNOTES:

1. WATER HEATER (EQUIPMENT SCHEDULE ITEM NUMBER ME28) PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO FLOOR DRAIN. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO FLOOR DRAIN.
2. 4" INTAKE AND 4" VENT PIPE TO CONCENTRIC VENT.
3. 4" CONCENTRIC VENT KIT.
4. TRAPPED PRIMARY AND SECONDARY CONDENSATE PIPES TO 2" OPEN RECEPTACLE. CONDENSATE PIPE SIZES TO MATCH UNIT DISCHARGE SIZES.

0' 2' 4' 8' 12'

SCALE: 1" = 4'

REVISION NUMBER	REVISIONS	DATE	BY

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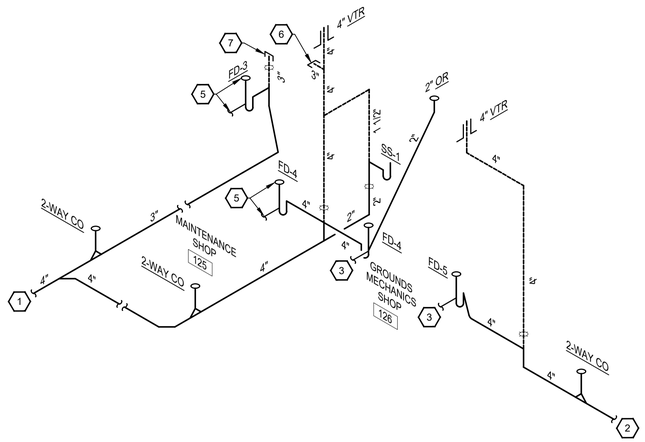
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
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Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREA "C"
ENLARGED MECHANICAL ROOM
PLUMBING PLAN

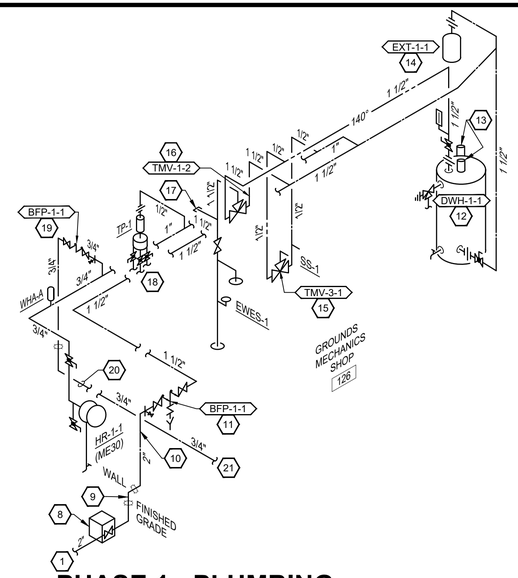
CORY SHARRARD REGISTERED 26725 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-1-400	△



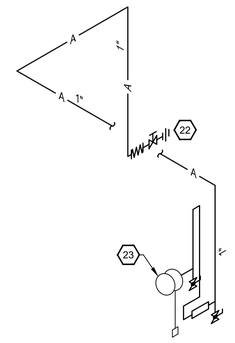
1 PHASE 1 - PLUMBING - WASTE & VENT RISER DIAGRAM

NOT TO SCALE



2 PHASE 1 - PLUMBING - DOMESTIC WATER RISER DIAGRAM

NOT TO SCALE



3 PHASE 1 - PLUMBING - COMPRESSED AIR RISER DIAGRAM

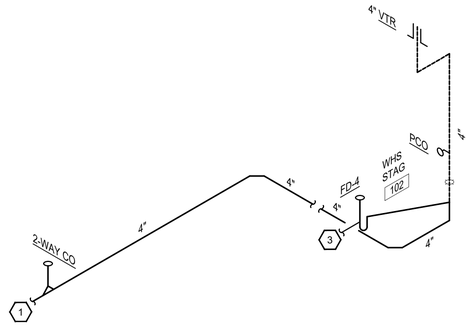
NOT TO SCALE

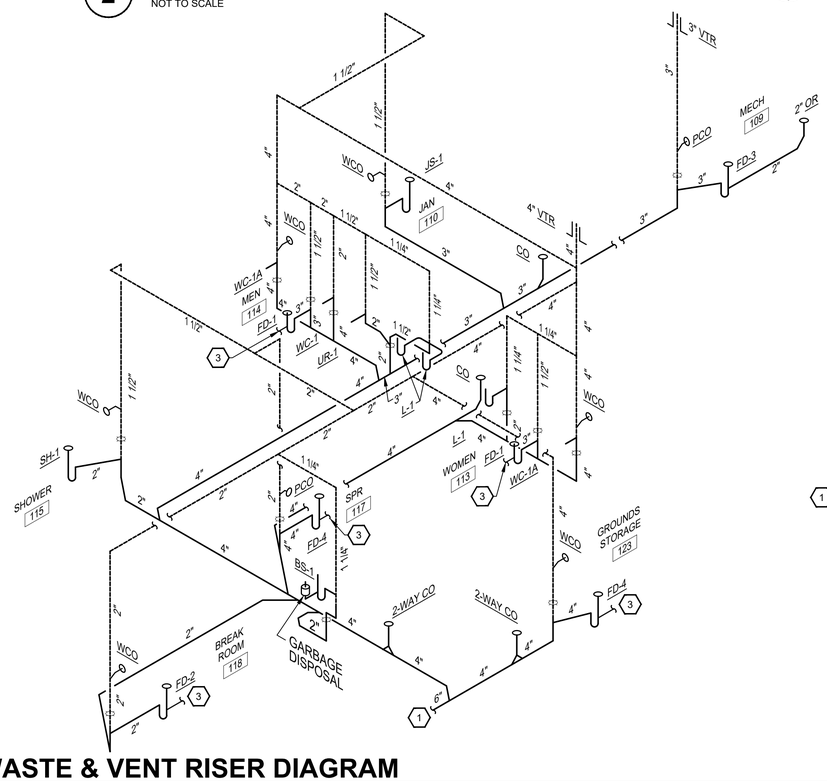
GENERAL NOTES:

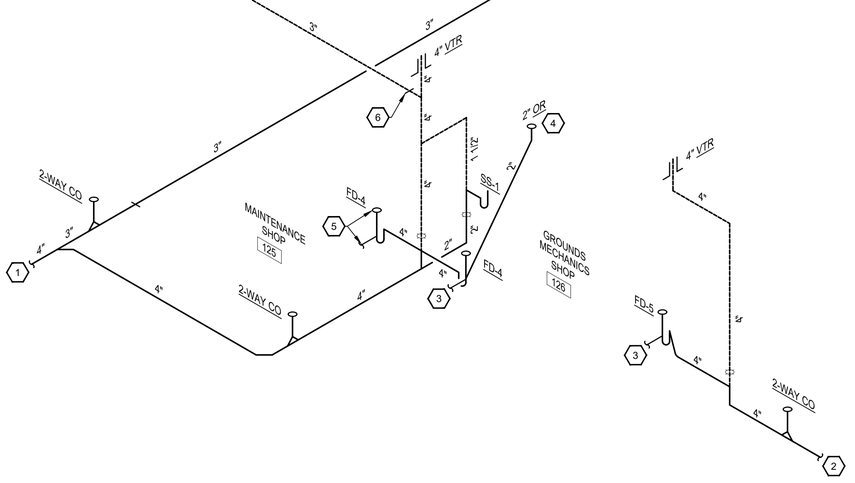
1. SEE P-001 AND PLANS FOR ADDITIONAL GENERAL AND SPECIAL NOTES.
2. SEE PLUMBING FIXTURE SCHEDULE FOR PIPE SIZES NOT REFLECTED ON RISER DIAGRAM.
3. SEE SHEET A-1-701 FOR EQUIPMENT SCHEDULE ITEMS.

SHEET KEYNOTES:

1. SEE SITE UTILITY PLAN FOR CONTINUATION.
2. EXTEND TO OIL/WATER SEPARATOR. SEE SITE UTILITIES PLAN FOR CONTINUATION.
3. PROVIDE 1/2" DCW AT TRAP AND EXTEND TO TRAP PRIMER.
4. REMOVE OPEN RECEPTACLE FUNNEL TO FLUSH WITH FINISHED FLOOR.
5. PROVIDE FLOOR DRAIN UNDER PHASE 1 IF SLAB IS POURED IN THIS AREA. PROVIDE CAPPED STUB-UP IF SLAB IS NOT POURED IN PHASE 1. COMPLETE FLOOR DRAIN INSTALLATION UNDER PHASE 2. PROVIDE 1/2" TRAP PRIMER PIPE FROM INLET SIDE OF P-TRAP, EXTEND TO WALL AS REQUIRED AND CAP UNDER PHASE 1. REMOVE CAP AND COMPLETE INSTALLATION UNDER PHASE 2.
6. PROVIDE 3" VENT PIPE THROUGH WALL AND CAP UNDER PHASE 1. REMOVE CAP AND INSTALL 3" VENT PIPE CONTINUATION UNDER PHASE 2.
7. PROVIDE 3" VENT UP TO ABOVE FINISHED FLOOR AND CAP UNDER PHASE 1. REMOVE CAP AND INSTALL 3" VENT PIPE CONTINUATION UNDER PHASE 2.
8. PROVIDE VALVE BOX WITH 2" SHUT-OFF VALVE UNDER PHASE 1 FOR TEMPORARY SERVICE TO GROUNDS MECHANICS SHOP 126.
9. PROVIDE 2" DOMESTIC WATER PIPE TO 12" ABOVE GRADE AND INTO GROUND MECHANICS SHOP 126 UNDER PHASE 1.
10. PROVIDE 2" DOMESTIC WATER PIPE UP TO 7'-6' AFF UNDER PHASE 1.
11. PROVIDE BACKFLOW PREVENTER WITH STRAINER AT 7'-6" AFF UNDER PHASE 1. PROVIDE AIR GAP FITTING AND DRAIN PIPE DOWN AT WALL AND SPILL TO FLOOR UNDER PHASE 1. BACKFLOW PREVENTER TO BE MOVED TO SPRINKLER ROOM 117 UNDER PHASE 2.
12. PROVIDE WATER HEATER (EQUIPMENT SCHEDULE ITEM NUMBER ME28) IN GROUNDS MECHANICS SHOP 126 UNDER PHASE 1. WATER HEATER PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO OPEN RECEPTACLE. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO OPEN RECEPTACLE. PROVIDE TRAPPED PRIMARY AND SECONDARY CONDENSATE PIPES AND EXTEND TO OPEN RECEPTACLE. WATER HEATER TO BE REMOVED UNDER PHASE 2 AND INSTALLED IN WAREHOUSE MECHANICAL ROOM 109.
13. 4" INTAKE AND 4" EXHAUST PIPES. SEE PLAN FOR CONTINUATION.
14. INSTALL EXPANSION TANK IN GROUNDS MECHANICS SHOP 126 UNDER PHASE 1. EXPANSION TANK TO BE REMOVED UNDER PHASE 2 AND INSTALLED IN WAREHOUSE MECHANICAL ROOM 109.
15. PROVIDE TMV-3-1 UNDER PHASE 1. REMOVE TEMPERING VALVE AND RETAIN FOR INSTALLATION IN MAIL ROOM UNDER PHASE 2. INSTALL IN MAIL ROOM MECHANICAL ROOM 103 UNDER ALTERNATE 1.
16. PROVIDE TMV-1-2 UNDER PHASE 1. REMOVE TEMPERING VALVE AND RETAIN FOR INSTALLATION IN WAREHOUSE MECHANICAL ROOM 109 UNDER PHASE 2.
17. UNDER PHASE 1, PROVIDE CAPPED 1 1/2" TEPID WATER CONNECTION FOR MAINTENANCE SHOP EWES-1 INSTALLED UNDER PHASE 2.
18. PROVIDE TRAP PRIMER AND 1/2" DCW PIPES TO ASSOCIATED FLOOR DRAINS UNDER PHASE 1. SEE KEYNOTE 5 ABOVE.
19. PROVIDE DOUBLE CHECK VALVE ASSEMBLY UNDER PHASE 1.
20. PROVIDE 3/4" DCW FROM DOUBLE CHECK VALVE ASSEMBLY BELOW SLAB UNDER PHASE 1.
21. 3/4" DCW TO GROUND HYDRANT AT WASH PAD UNDER PHASE 1. SEE SITE UTILITIES PLAN FOR CONTINUATION.
22. CONNECT TO OWNER PROVIDED AIR COMPRESSOR (EQUIPMENT SCHEDULE ITEM NUMBER ME24) PROVIDED UNDER PHASE 1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS. REMOVE AND RETURN TO OWNER UNDER PHASE 2.
23. OWNER PROVIDED COMPRESSED AIR HOSE REEL (EQUIPMENT SCHEDULE ITEM NUMBER ME17) PROVIDED UNDER PHASE 1.







4 PHASE 2 - PLUMBING - WAREHOUSE WASTE & VENT RISER DIAGRAM

NOT TO SCALE

REVISION NUMBER	REVISIONS	DATE	BY

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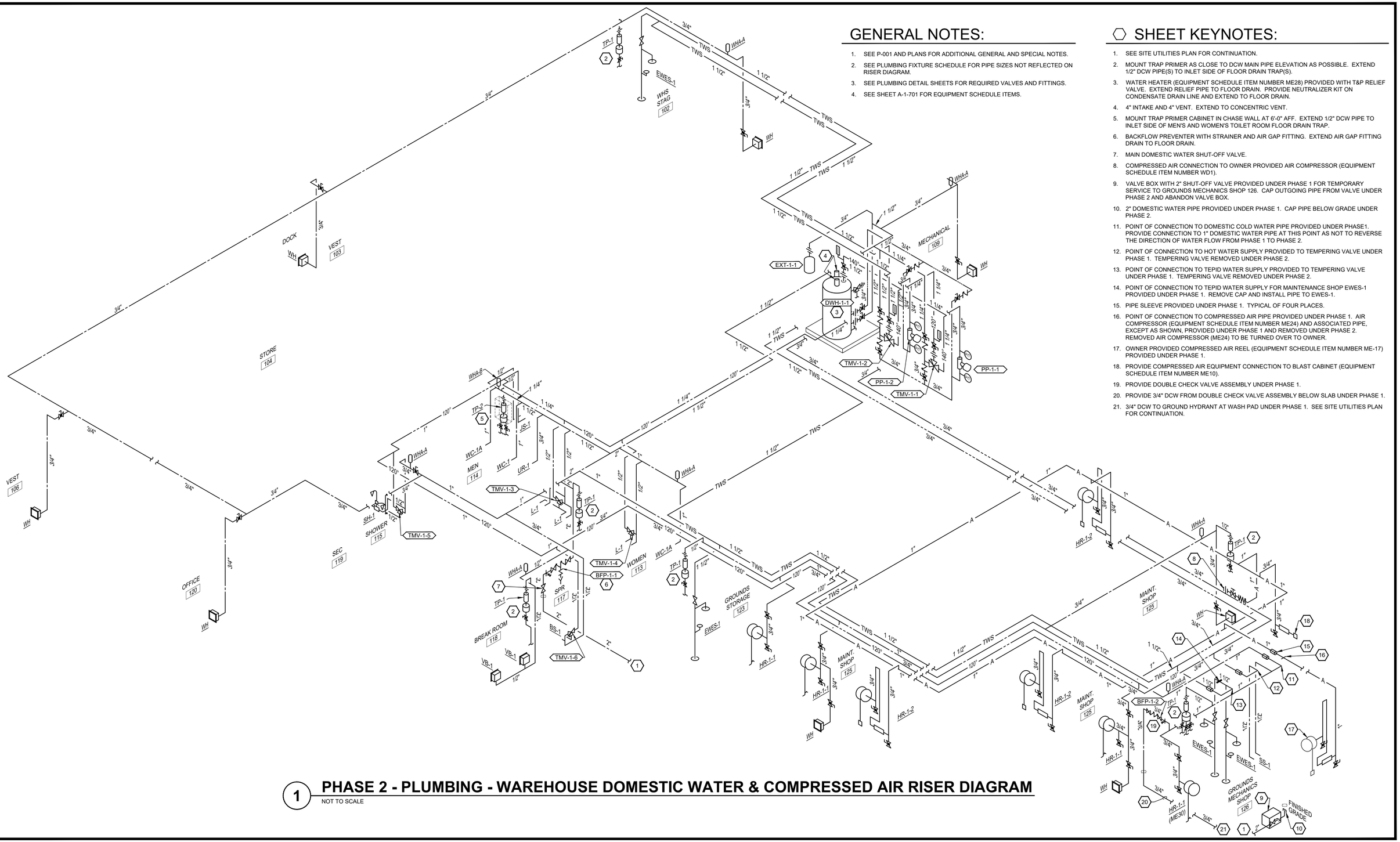
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West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE
PLUMBING
PLUMBING RISER DIAGRAMS

CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-1-900	



GENERAL NOTES:

1. SEE P-001 AND PLANS FOR ADDITIONAL GENERAL AND SPECIAL NOTES.
2. SEE PLUMBING FIXTURE SCHEDULE FOR PIPE SIZES NOT REFLECTED ON RISER DIAGRAM.
3. SEE PLUMBING DETAIL SHEETS FOR REQUIRED VALVES AND FITTINGS.
4. SEE SHEET A-1-701 FOR EQUIPMENT SCHEDULE ITEMS.

SHEET KEYNOTES:

1. SEE SITE UTILITIES PLAN FOR CONTINUATION.
2. MOUNT TRAP PRIMER AS CLOSE TO DCW MAIN PIPE ELEVATION AS POSSIBLE. EXTEND 1/2" DCW PIPE(S) TO INLET SIDE OF FLOOR DRAIN TRAP(S).
3. WATER HEATER (EQUIPMENT SCHEDULE ITEM NUMBER ME28) PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO FLOOR DRAIN. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO FLOOR DRAIN.
4. 4" INTAKE AND 4" VENT. EXTEND TO CONCENTRIC VENT.
5. MOUNT TRAP PRIMER CABINET IN CHASE WALL AT 6'-0" AFF. EXTEND 1/2" DCW PIPE TO INLET SIDE OF MEN'S AND WOMEN'S TOILET ROOM FLOOR DRAIN TRAP.
6. BACKFLOW PREVENTER WITH STRAINER AND AIR GAP FITTING. EXTEND AIR GAP FITTING DRAIN TO FLOOR DRAIN.
7. MAIN DOMESTIC WATER SHUT-OFF VALVE.
8. COMPRESSED AIR CONNECTION TO OWNER PROVIDED AIR COMPRESSOR (EQUIPMENT SCHEDULE ITEM NUMBER WD1).
9. VALVE BOX WITH 2" SHUT-OFF VALVE PROVIDED UNDER PHASE 1 FOR TEMPORARY SERVICE TO GROUNDS MECHANICS SHOP 126. CAP OUTGOING PIPE FROM VALVE UNDER PHASE 2 AND ABANDON VALVE BOX.
10. 2" DOMESTIC WATER PIPE PROVIDED UNDER PHASE 1. CAP PIPE BELOW GRADE UNDER PHASE 2.
11. POINT OF CONNECTION TO DOMESTIC COLD WATER PIPE PROVIDED UNDER PHASE1. PROVIDE CONNECTION TO 1" DOMESTIC WATER PIPE AT THIS POINT AS NOT TO REVERSE THE DIRECTION OF WATER FLOW FROM PHASE 1 TO PHASE 2.
12. POINT OF CONNECTION TO HOT WATER SUPPLY PROVIDED TO TEMPERING VALVE UNDER PHASE 1. TEMPERING VALVE REMOVED UNDER PHASE 2.
13. POINT OF CONNECTION TO TEPID WATER SUPPLY PROVIDED TO TEMPERING VALVE UNDER PHASE 1. TEMPERING VALVE REMOVED UNDER PHASE 2.
14. POINT OF CONNECTION TO TEPID WATER SUPPLY FOR MAINTENANCE SHOP EWES-1 PROVIDED UNDER PHASE 1. REMOVE CAP AND INSTALL PIPE TO EWES-1.
15. PIPE SLEEVE PROVIDED UNDER PHASE 1. TYPICAL OF FOUR PLACES.
16. POINT OF CONNECTION TO COMPRESSED AIR PIPE PROVIDED UNDER PHASE 1. AIR COMPRESSOR (EQUIPMENT SCHEDULE ITEM NUMBER ME24) AND ASSOCIATED PIPE, EXCEPT AS SHOWN, PROVIDED UNDER PHASE 1 AND REMOVED UNDER PHASE 2. REMOVED AIR COMPRESSOR (ME24) TO BE TURNED OVER TO OWNER.
17. OWNER PROVIDED COMPRESSED AIR REEL (EQUIPMENT SCHEDULE ITEM NUMBER ME-17) PROVIDED UNDER PHASE 1.
18. PROVIDE COMPRESSED AIR EQUIPMENT CONNECTION TO BLAST CABINET (EQUIPMENT SCHEDULE ITEM NUMBER ME10).
19. PROVIDE DOUBLE CHECK VALVE ASSEMBLY UNDER PHASE 1.
20. PROVIDE 3/4" DCW FROM DOUBLE CHECK VALVE ASSEMBLY BELOW SLAB UNDER PHASE 1.
21. 3/4" DCW TO GROUND HYDRANT AT WASH PAD UNDER PHASE 1. SEE SITE UTILITIES PLAN FOR CONTINUATION.

1 PHASE 2 - PLUMBING - WAREHOUSE DOMESTIC WATER & COMPRESSED AIR RISER DIAGRAM

NOT TO SCALE

REVISION NUMBER	REVISIONS	DATE	BY

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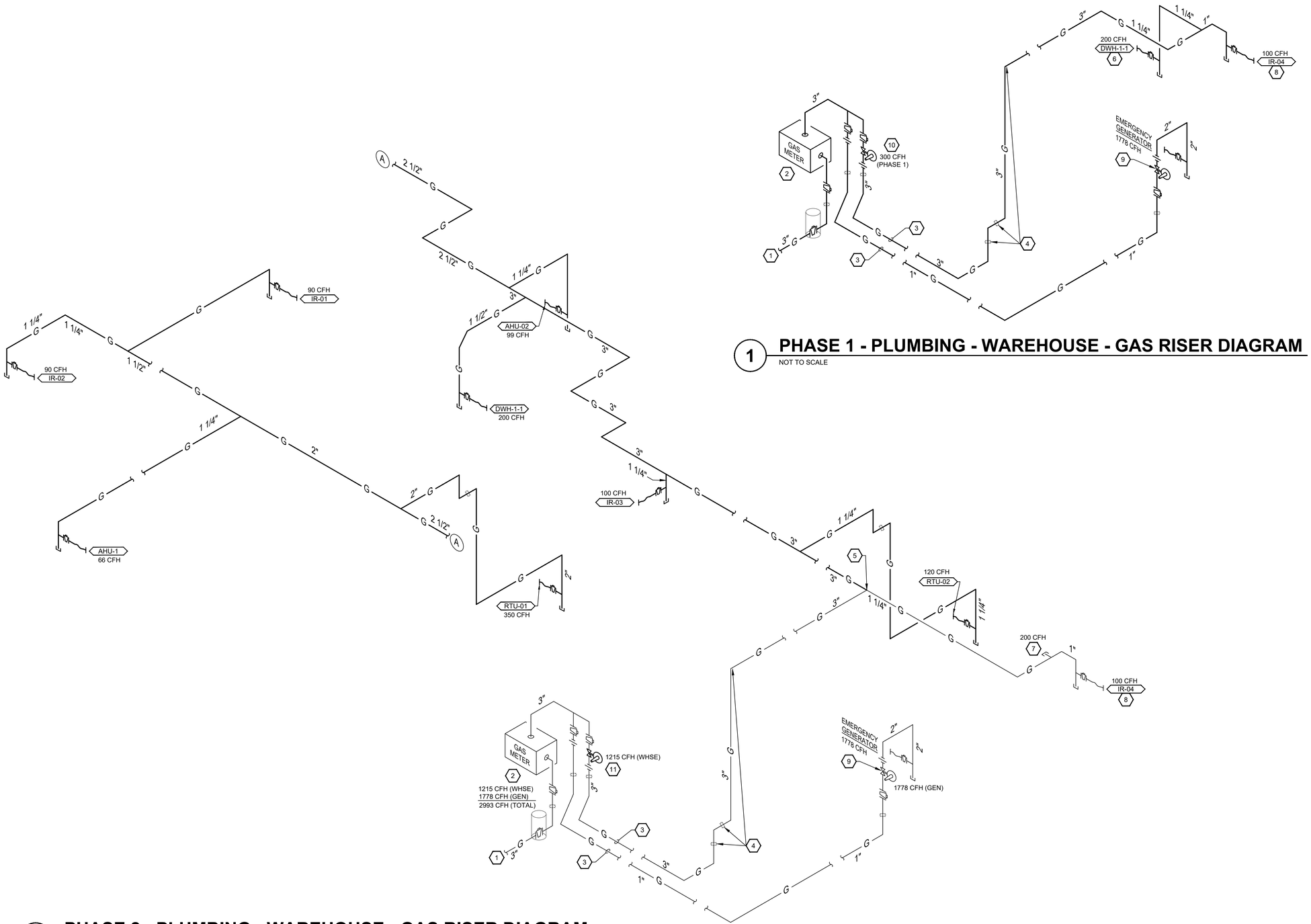
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE
PLUMBING
DOMESTIC WATER &
COMPRESSED AIR RISER DIAGRAM

CORY SHARRARD
REGISTERED
28725
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
6/6/21

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-1-901	



1 PHASE 1 - PLUMBING - WAREHOUSE - GAS RISER DIAGRAM

NOT TO SCALE

2 PHASE 2 - PLUMBING - WAREHOUSE - GAS RISER DIAGRAM

NOT TO SCALE

GENERAL NOTES:

1. SEE SHEET P-001 AND PLANS FOR ADDITIONAL GENERAL AND SPECIAL NOTES.
2. SEE SHEET P-502 FOR GAS PIPE EQUIPMENT CONNECTION DETAIL.

⬡ SHEET KEYNOTES:

1. SEE SITE UTILITY PLAN FOR CONTINUATION AND SIZE.
2. GAS METER AND REGULATOR FOR WAREHOUSE AT THIS LOCATION UNDER PHASE 1. PROVIDE REGULATOR FOR EMERGENCY GENERATOR AT GENERATOR.
3. PROVIDE GAS PIPE BELOW GRADE UNDER PHASE 1.
4. PROVIDE GAS PIPE UP TO 12" AFG AND EXTEND THROUGH WALL INTO MAINTENANCE SHOP 125 UNDER PHASE 1. EXTEND GAS PIPE UP TO BOTTOM OF STRUCTURE AT WALL UNDER PHASE 1.
5. POINT OF CONNECTION TO GAS PIPE PROVIDED UNDER PHASE 1.
6. PROVIDE WATER HEATER (EQUIPMENT SCHEDULE ITEM NUMBER ME28) UNDER PHASE 1. REMOVE WATER HEATER AND ASSOCIATED GAS PIPING UNDER PHASE 2. INSTALL IN WAREHOUSE MECHANICAL ROOM 109 UNDER PHASE 2.
7. CAPPED GAS PIPE FROM WATER HEATER (EQUIPMENT SCHEDULE ITEM NUMBER ME28) REMOVED UNDER PHASE 2.
8. PROVIDE INFRARED HEATER UNDER PHASE 1. HEATER TO REMAIN UNDER PHASE 2.
9. PROVIDE NEW GAS REGULATOR FOR EMERGENCY GENERATOR UNDER PHASE 1.
10. PROVIDE NEW GAS REGULATOR SIZED FOR LOAD SHOWN FOR PHASE 1 IN PHASE 1 CONSTRUCTION.
11. PROVIDE NEW GAS REGULATOR SIZED FOR INCREASED LOAD SHOWN FOR TOTAL WAREHOUSE FOR FINAL PHASE OF PROJECT.

REVISION NUMBER	REVISIONS	DATE	BY

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE
PLUMBING
GAS RISER DIAGRAM

CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

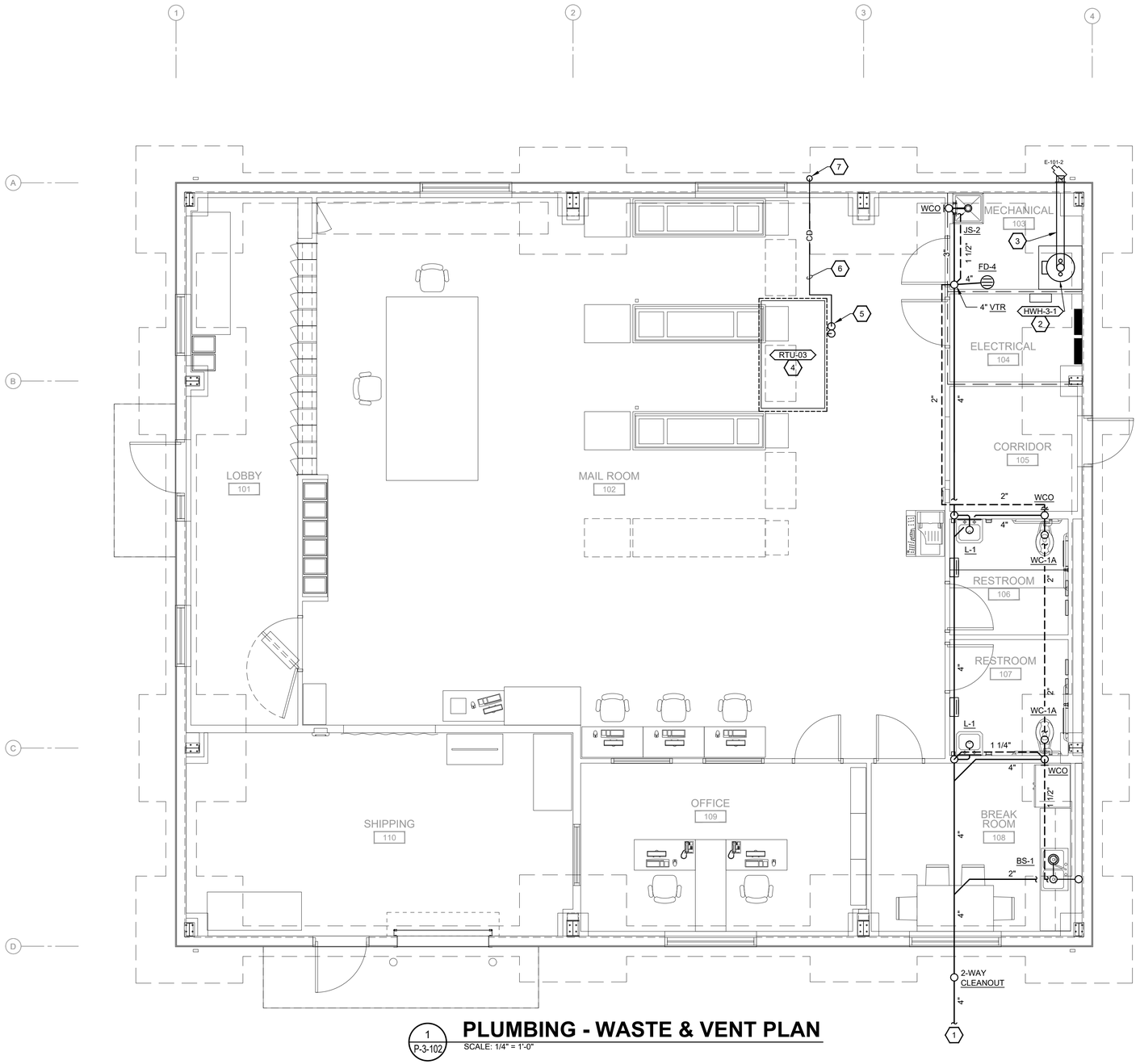
JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-1-902	△

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT AND SPECIALTIES DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.

⬡ SHEET KEYNOTES:

1. SEE SITE UTILITIES PLAN FOR CONTINUATION.
2. WATER HEATER PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO FLOOR DRAIN. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO FLOOR DRAIN.
3. DUAL-CHANNEL VENT / INTAKE SYSTEM.
4. RTU ON ROOF.
5. TRAPPED CONDENSATE DRAIN PIPE AT RTU CONDENSATE DISCHARGE OUTLET. CONDENSATE PIPE SIZE TO MATCH UNIT DISCHARGE SIZE.
6. UNIT SIZED CONDENSATE DRAIN PIPE ON ROOF. INSTALL PIPE ON UNISTRUT FASTENED TO THE STANDING SEAM ROOF WITH UNISTRUT S-5 CLAMPS. PIPE TO BE ATTACHED TO UNISTRUT WITH UNISTRUT CUSH-A-CLAMP ASSEMBLY. PROVIDE SUPPORT ASSEMBLY SPACING PER MANUFACTURER'S GUIDELINES. MAINTAIN RTU-3 INSTALLATION CLEARANCES. NOTE: CONDENSATE DRAIN PIPE AND GAS PIPE ARE TO BE INSTALLED ON THE SAME UNISTRUT SUPPORT ASSEMBLIES.
7. SPILL CONDENSATE TO GUTTER.



1 P-3-102 **PLUMBING - WASTE & VENT PLAN**

SCALE: 1/4" = 1'-0"

0' 2' 4' 8' 12'

SCALE: 1" = 4'

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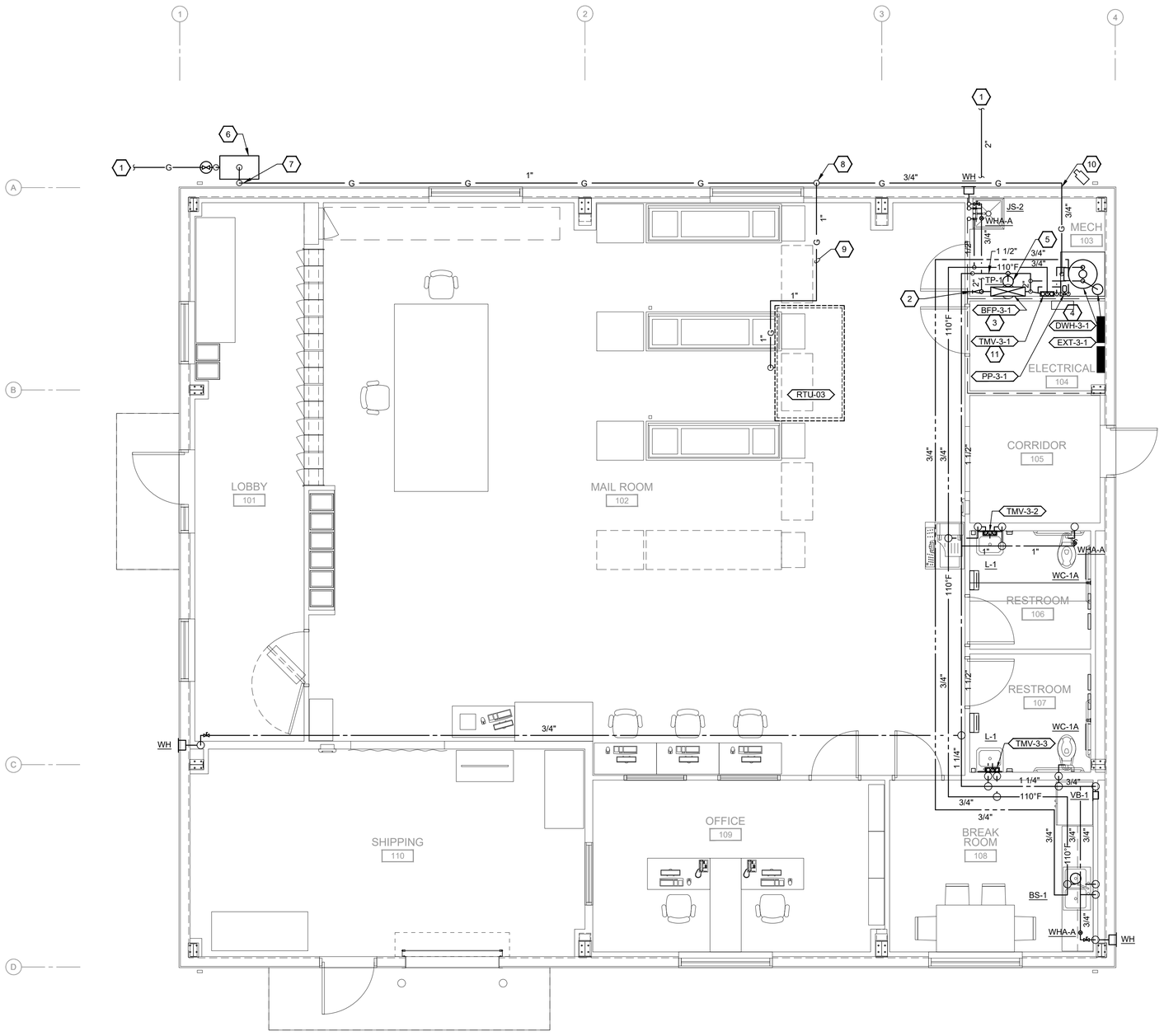
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1

PLUMBING - WASTE & VENT PLAN

CORY SHARRARD REGISTERED 28726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
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DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-3-101	



1 P-3-101 **PLUMBING - DOMESTIC WATER & GAS**

SCALE: 1/4" = 1'-0"

SCALE: 1" = 4'

GENERAL NOTES:

1. SEE SHEET P-001 FOR PLUMBING LEGEND AND ADDITIONAL NOTES.
2. SEE P-500 SHEETS FOR EQUIPMENT, SPECIALTIES AND INSTALLATION DETAILS.
3. SEE P-600 SHEETS FOR EQUIPMENT, FIXTURES AND SPECIALTIES SCHEDULES.
4. SEE SCHEDULES AND DETAILS FOR EQUIPMENT, FIXTURES AND SPECIALTIES MOUNTING HEIGHTS NOT PROVIDED ON ARCHITECTURAL DOCUMENTS.
5. DO NOT INSTALL ANY PLUMBING PIPES ABOVE ANY ELECTRICAL PANELS, CONTROL PANELS OR IT/SEC EQUIPMENT.

SHEET KEYNOTES:

1. SEE SITE UTILITIES PLAN FOR CONTINUATION.
2. DOMESTIC WATER MAIN SHUT-OFF VALVE.
3. BACKFLOW PREVENTER WITH STRAINER AND AIR GAP FITTING. EXTEND AIR GAP FITTING DRAIN TO FLOOR DRAIN.
4. WATER HEATER PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO FLOOR DRAIN. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO FLOOR DRAIN.
5. MOUNT TRAP PRIMER AS CLOSE TO DCW MAIN PIPE ELEVATION AS POSSIBLE. EXTEND 1/2" DCW DOWN AT WALL TO BELOW SLAB AND INTO INLET SIDE OF FLOOR DRAIN TRAP.
6. GAS METER AND REGULATOR.
7. GAS PIPE UP TO 13'-0" AFG.
8. GAS PIPE UP TO ABOVE ROOF.
9. GAS PIPE ON ROOF. INSTALL PIPE ON UNISTRUT FASTENED TO THE STANDING SEAM ROOF WITH UNISTRUT S-5 CLAMPS. PIPE TO BE ATTACHED TO UNISTRUT WITH UNISTRUT CUSH-A-CLAMP ASSEMBLY. PROVIDE SUPPORT ASSEMBLY SPACING PER MANUFACTURER'S GUIDELINES. MAINTAIN RTU-3 INSTALLATION CLEARANCES. NOTE: GAS PIPE AND CONDENSATE PIPE ARE TO BE INSTALLED ON THE SAME UNISTRUT SUPPORT ASSEMBLIES.
10. GAS PIPE THROUGH WALL INTO MECHANICAL ROOM.
11. TMV-3-1 PROVIDED UNDER PHASE 1 AND REMOVED/RETAINED UNDER PHASE 2. INSTALL IN MAIL ROOM MECHANICAL ROOM 103 UNDER ALTERNATE 1.

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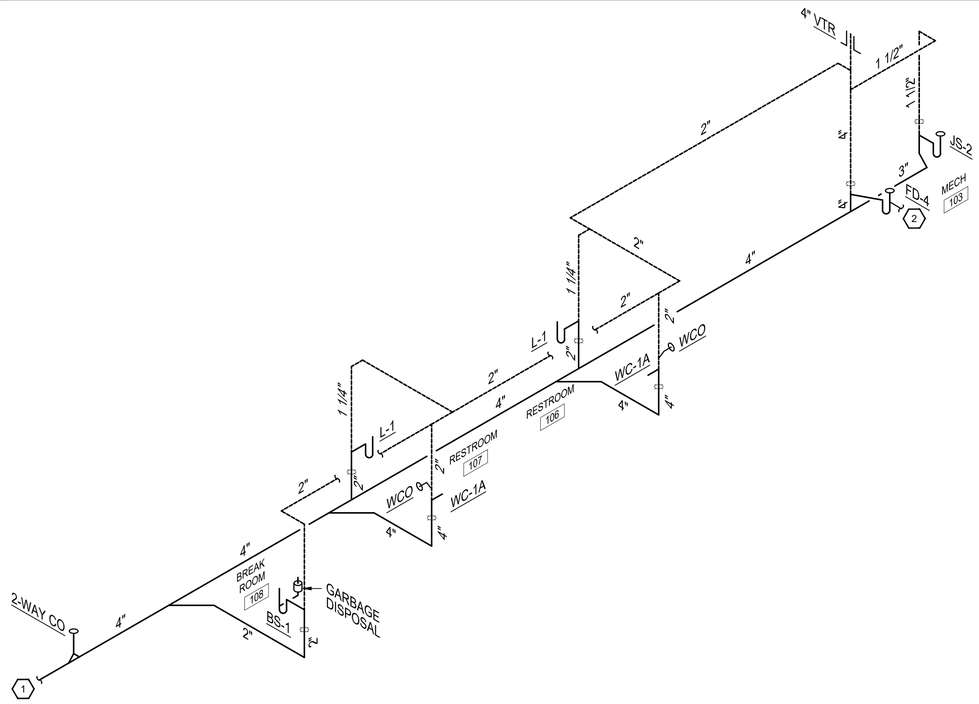
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
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CAPITOL MAIL ROOM
ALTERNATE 1

PLUMBING - DOMESTIC WATER & GAS PLAN

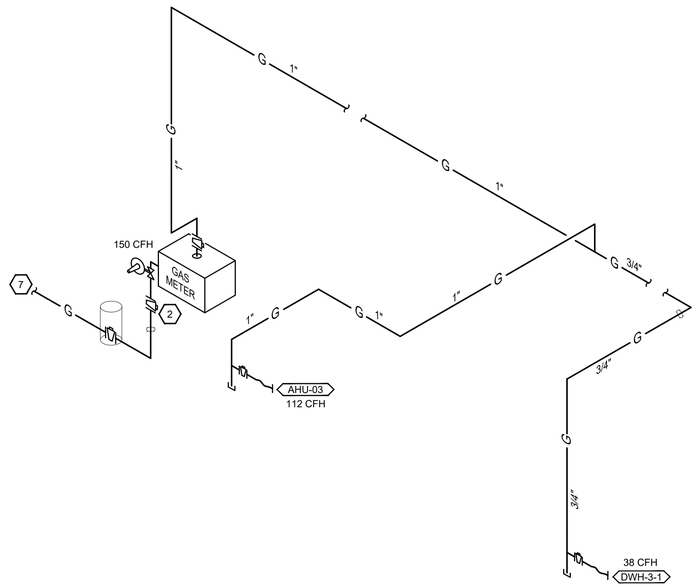
CORY SHARRARD REGISTERED 28726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 6/16/21

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DATE:	AUGUST 6, 2021
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DESIGNED BY:	MAS
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P-3-102	



1 PLUMBING - MAIL ROOM - SOIL, WASTE & VENT RISER DIAGRAM

NOT TO SCALE



3 PLUMBING - MAIL ROOM - GAS RISER DIAGRAM

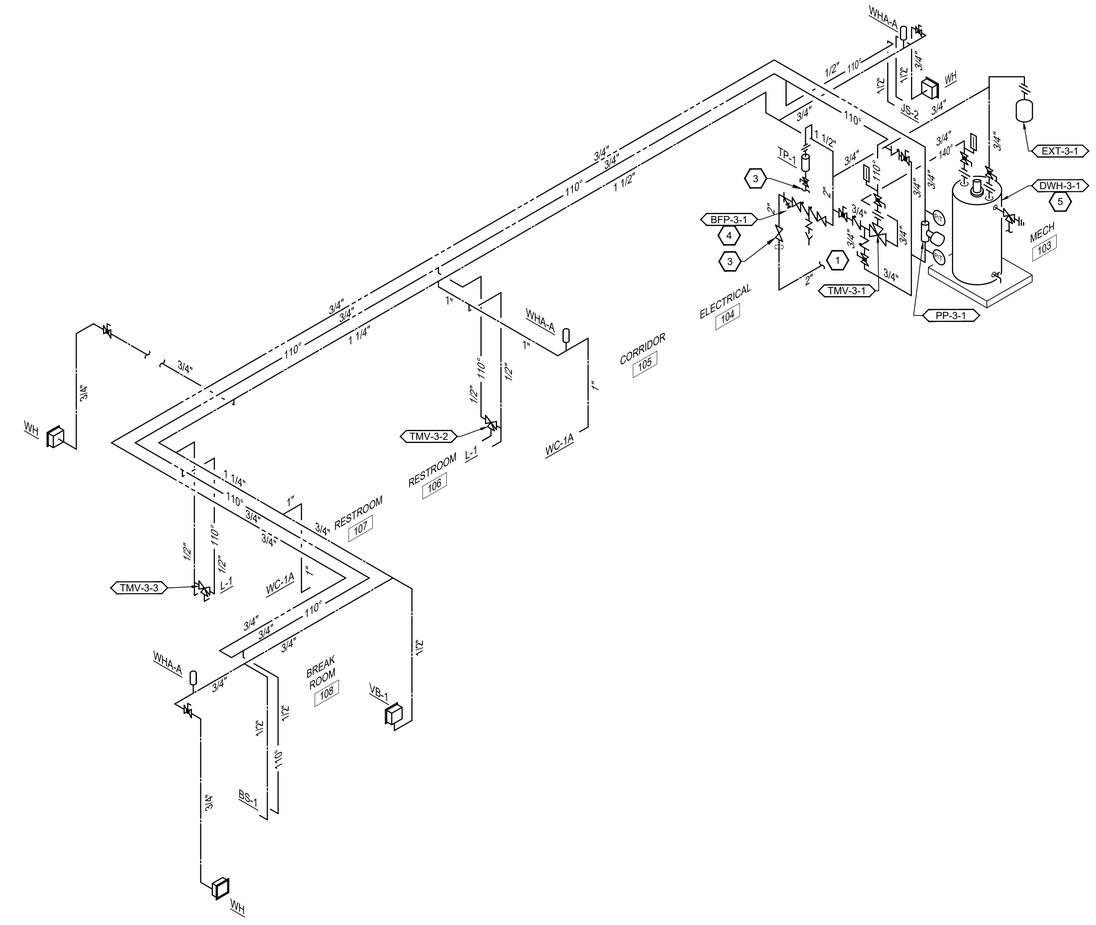
NOT TO SCALE

GENERAL NOTES:

1. SEE P-001 AND PLANS FOR ADDITIONAL GENERAL AND SPECIAL NOTES.
2. SEE PLUMBING FIXTURE SCHEDULE FOR PIPE SIZES NOT REFLECTED ON RISER DIAGRAM.

SHEET KEYNOTES:

1. SEE SITE UTILITIES PLAN FOR CONTINUATION.
2. EXTEND 1/2" DCW PIPE TO TRAP PRIMER.
3. MAIN DOMESTIC WATER SHUT-OFF VALVE.
4. BACKFLOW PREVENTER WITH STRAINER AND AIR GAP FITTING. EXTEND AIR GAP FITTING DRAIN TO FLOOR DRAIN.
5. WATER HEATER PROVIDED WITH T&P RELIEF VALVE. EXTEND RELIEF PIPE TO FLOOR DRAIN. PROVIDE NEUTRALIZER KIT ON CONDENSATE DRAIN LINE AND EXTEND TO FLOOR DRAIN.
6. MOUNT TRAP PRIMER AS CLOSE TO DCW MAIN PIPE ELEVATION AS POSSIBLE. EXTEND 1/2" DCW PIPE TO INLET SIDE OF FLOOR DRAIN TRAP.
7. SEE SITE UTILITIES PLAN FOR CONTINUATION AND SIZE.



2 PLUMBING - MAIL ROOM - DOMESTIC WATER RISER DIAGRAM

NOT TO SCALE

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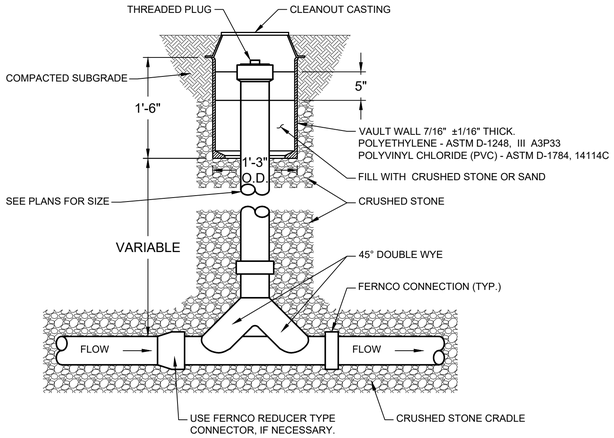
PROJECT INFORMATION
West Virginia Department of Administration
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CAPITOL MAIL ROOM
ALTERNATE 1

PLUMBING RISER DIAGRAMS

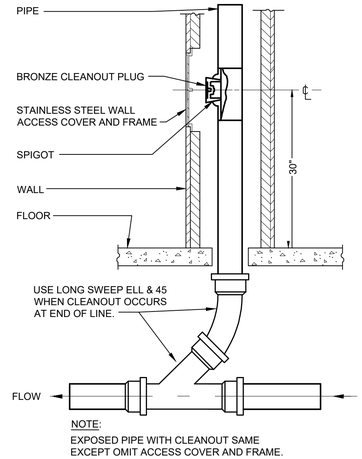
CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
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TYPICAL TWO WAY TEST TEE CLEANOUT DETAIL

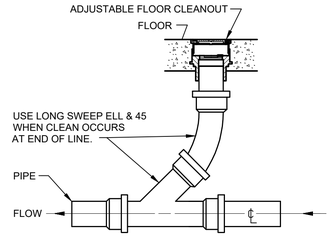
1 NOT TO SCALE



NOTE:
EXPOSED PIPE WITH CLEANOUT SAME EXCEPT OMIT ACCESS COVER AND FRAME.

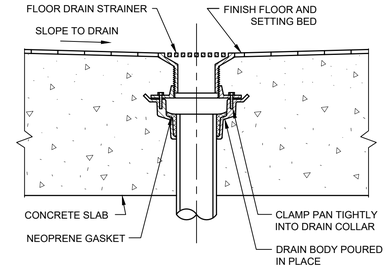
TYPICAL WALL CLEANOUT DETAIL

2 NOT TO SCALE



TYPICAL FLOOR CLEANOUT DETAIL

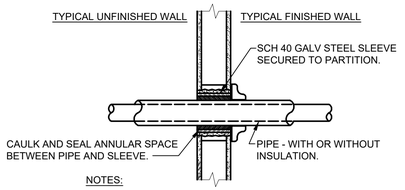
3 NOT TO SCALE



NOTE: PROVIDE TRAP PRIMER CONNECTION ON INLET SIDE OF FLOOR DRAIN TRAP.

FLOOR DRAIN DETAIL

4 NOT TO SCALE

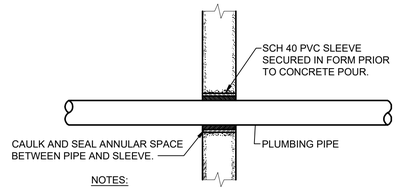


NOTES:

1. TYPICAL FOR NON-INSULATED PIPE AND CONDUIT.
2. ALL CAULKING AND SEALANT SHALL BE FIRE RATED (SEE SPECIFICATIONS).
3. WHERE PIPING IS EXPOSED AT FINISHED FLOOR, FLUSH MOUNT SLEEVE AND PROVIDE ESCUTCHEON PLATE.

PIPE PENETRATION THRU INTERIOR WALL DETAIL

5 NOT TO SCALE

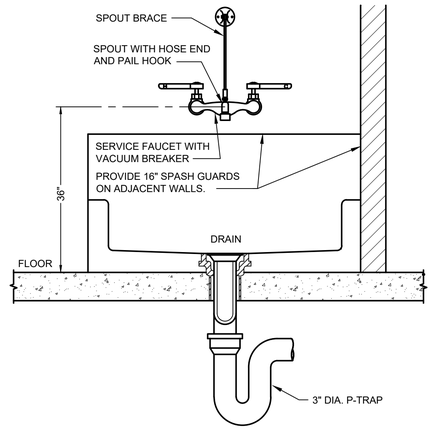


NOTES:

1. TYPICAL FOR SANITARY AND WATER PIPING. GAS PIPE SHALL BE INSTALLED AS RECOMMENDED BY THE SOMERSET GAS COMPANY.
2. ALL CAULKING AND SEALANT SHALL BE WATER TIGHT (SEE SPECIFICATIONS).
3. WHERE PIPING IS EXPOSED AT FINISHED FLOOR, FLUSH MOUNT SLEEVE AND PROVIDE ESCUTCHEON PLATE.

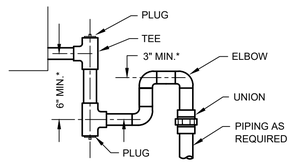
PIPE PENETRATION THRU CONCRETE WALL AND FLOOR DETAIL

6 NOT TO SCALE



JANITOR MOP SINK INSTALLATION DETAIL

7 NOT TO SCALE



* PER MANUFACTURER'S REQUIREMENTS

HVAC UNIT DRAIN TRAP DETAIL

8 NOT TO SCALE

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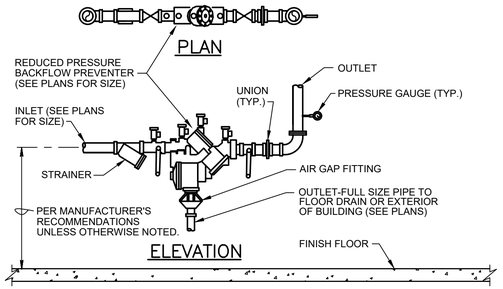
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PLUMBING
PLUMBING DETAILS

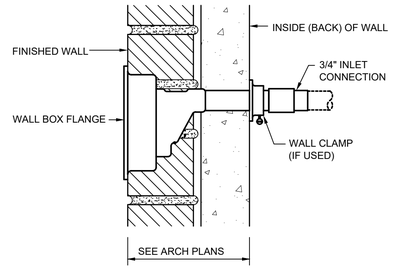
CORY SHARRARD REGISTERED 26755 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	STAFF
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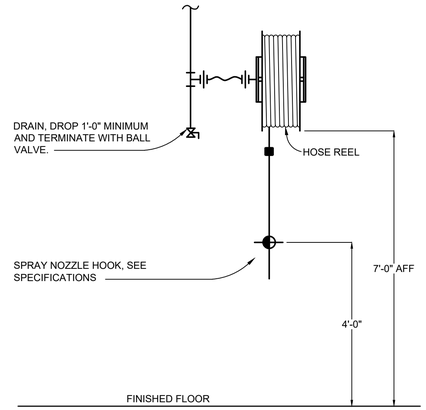
1 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER DETAIL

NOT TO SCALE



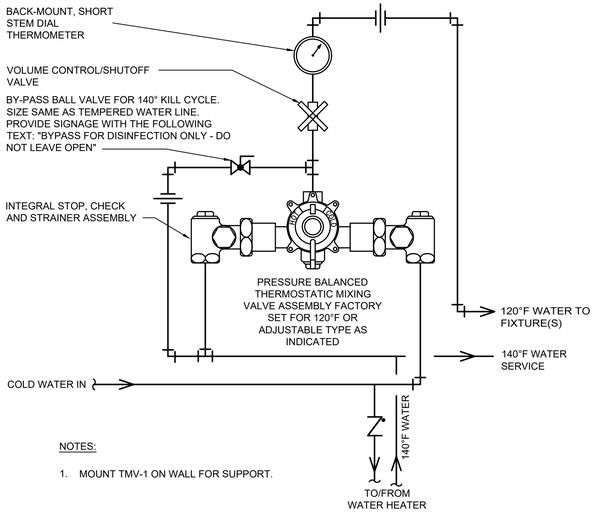
2 FREEZEPROOF WALL HYDRANT INSTALLATION DETAIL

NOT TO SCALE



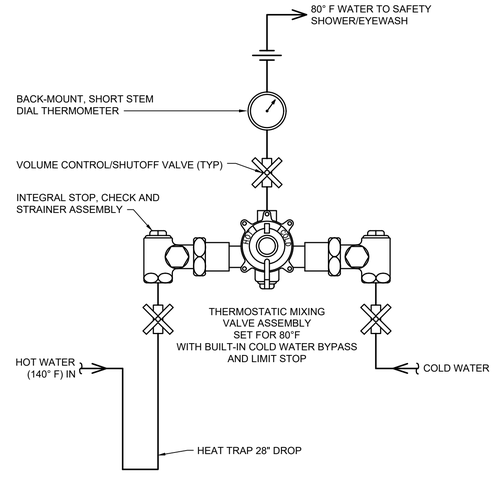
3 WALL MOUNTED WATER HOSE REEL DETAIL

NOT TO SCALE



4 THERMOSTATIC MIXING VALVE (TMV-1-1 & TMV-3-1) PIPING DETAIL

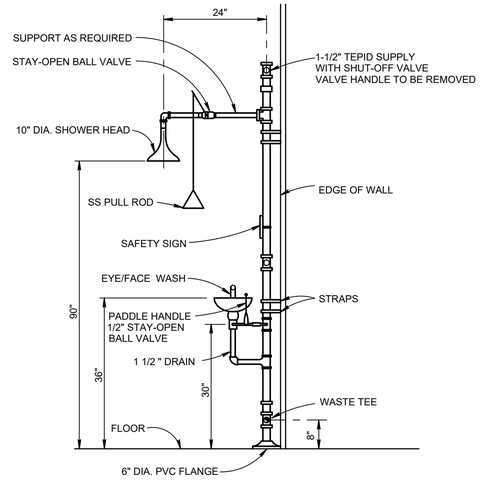
NOT TO SCALE



NOTE: PROVIDE WITH WALL CABINET MOUNTED ON UNISTRUT OR BUILDING STRUCTURE NEXT TO SAFETY SHOWER.

5 EMERGENCY FIXTURE (TMV-1-2) THERMOSTATIC MIXING VALVE PIPING DETAIL

NOT TO SCALE



6 EWES-1- SAFETY SHOWER-EYE/FACE WASH DETAIL

NOT TO SCALE

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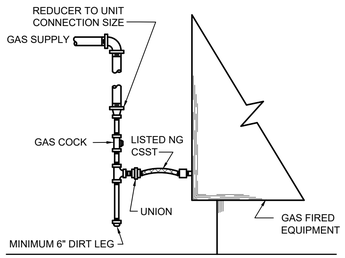
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PLUMBING DETAILS

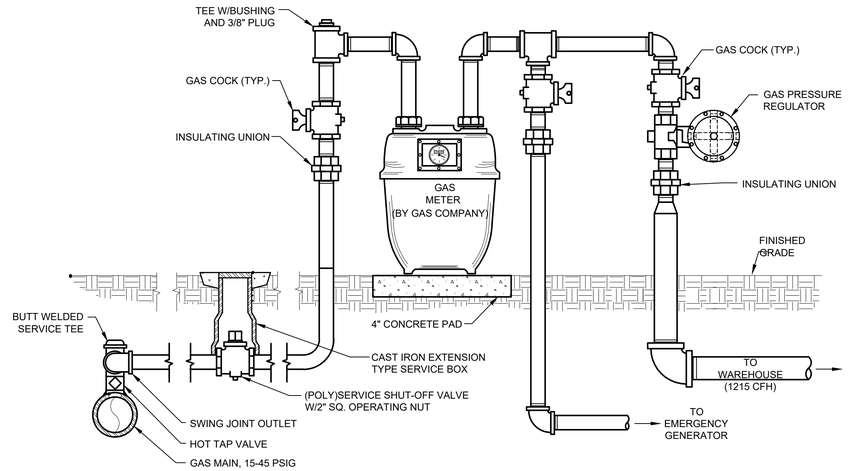
CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
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DRAWN BY:	STAFF
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1 GAS PIPE EQUIPMENT DETAIL

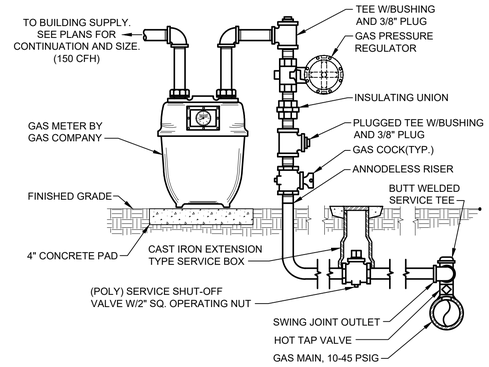
NOT TO SCALE



NOTE:
1. GAS PIPE SIZES AS CALLED FOR ON SITE PLAN AND FLOOR PLAN.
2. COORDINATE WITH LOCAL GAS COMPANY ALL DETAILS OF CONSTRUCTION OF GAS SERVICE PRIOR TO ANY CONSTRUCTION.
3. PROVIDE REGULATOR AT EMERGENCY GENERATOR.

3 WAREHOUSE & EMERGENCY GENERATOR GAS SERVICE CONNECTION DETAIL

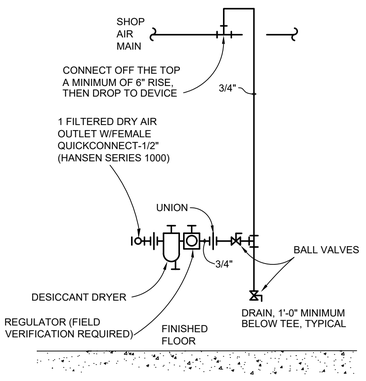
NOT TO SCALE



NOTE:
1. GAS PIPE SIZES AS CALLED FOR ON SITE PLAN AND FLOOR PLAN.
2. COORDINATE WITH LOCAL GAS COMPANY ALL DETAILS OF CONSTRUCTION OF GAS SERVICE PRIOR TO ANY CONSTRUCTION

3 MAIL ROOM GAS SERVICE CONNECTION DETAIL

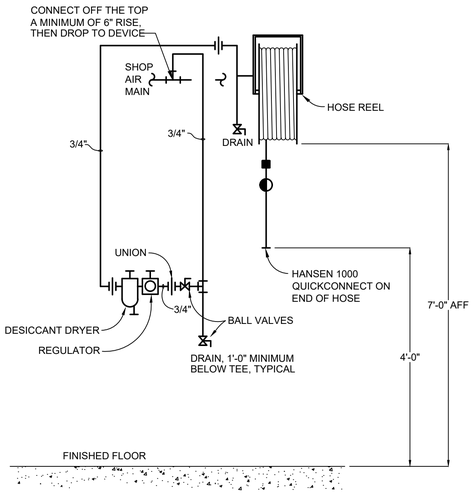
NOT TO SCALE



NOTE: SEE EQUIPMENT SCHEDULE MATRIX FOR EQUIPMENT THAT NEED REGULATORS

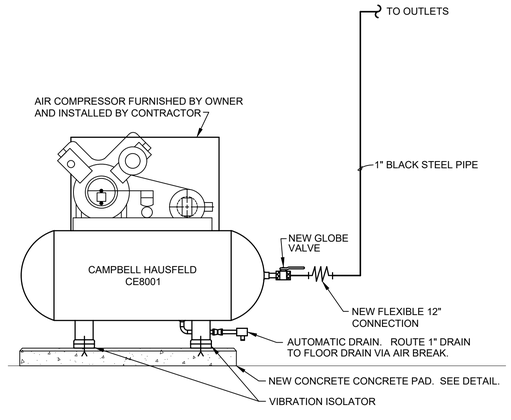
4 TYPICAL EQUIPMENT AIR DROPS

NOT TO SCALE



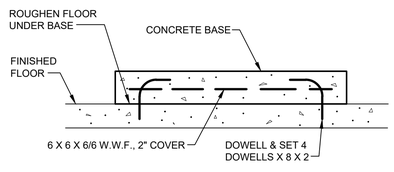
5 TYPICAL AIR HOSE REEL DROPS

NOT TO SCALE



6 AIR COMPRESSOR SYSTEM DETAIL

NOT TO SCALE



NOTE: CONCRETE BASE SHALL BE 4" LARGER ALL AROUND THAN THE BASE OF EQUIPMENT BEING SUPPORTED.

7 TYPICAL CONCRETE PAD

NOT TO SCALE

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
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AIRPORT PLANNING / DEVELOPMENT
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

PLUMBING
PLUMBING DETAILS

CORY SHARRARD REGISTERED 26725 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	STAFF
DESIGNED BY:	STAFF
CHECKED BY:	CVS
SHEET NO.	REVISION
P-502	

PLUMBING FIXTURES AND SPECIALTIES

MARK NO.	FIXTURE / SPECIALTY	DESCRIPTION (BASIS OF DESIGN)	FIXTURE UNITS			PIPE SIZES						
			DRAIN	CW	HW	TRAP	BRANCH	*VENT	CW SUPPLY	CW BRANCH	HW SUPPLY	HW BRANCH
BS-1	ADA 2-COMPARTMENT SINK C.T.M., H.C.C. WITH FAUCET & SPRAY ASME A112.19.3 ANSI A117.1	DAYTON - MODEL D23321 - ADA COMPLIANT SINK - #22 GAUGE, TYPE 300 STAINLESS STEEL, SELF-RIMMING, TWO BOWL, 33"Lx21-1/4"Wx6-9/16"D, (4) HOLES WITH BOTTOM SOUND DEADENING PADS. DELTA - EMMETT MODEL FAUCET, 1.8 GPM, CHROME-PLATED BRASS CONSTRUCTION, 8-11/16" SPOUT REACH, 8-5/16" SPOUT DECK CLEARANCE, HANDICAPPED ACCESSIBLE LEVER HANDLES, PULL-OUT SIDE SPRAY HOSE WITH INTEGRAL ANTI-SIPHON DEVICE, CHROME-PLATED BRASS DRAIN OUTLET, STAINLESS STEEL BASKET STRAINERS, IN-SINK-ERATOR MODEL LC-50-11 GARBAGE DISPOSAL, CHROME-PLATED P-TRAP WITH CLEANOUT, CHROME-PLATED TAILPIECE, CHROME-PLATED HOT AND COLD STOPS WITH SUPPLIES.	1 1/2	1	1	1 1/2"	1 1/2"	1 1/2"	3/8"	1/2"	3/8"	1/2"
EWES-1	BRADLEY MODEL S19-314DCBF SAFETY STATION ANSI/ISEA Z358.1, BARRIER FREE	COMBINATION SHOWER AND WIDE AREA EYE/FACE WASH - IMPACT RESISTANT PLASTIC SHOWER HEAD, STAINLESS STEEL EYE/FACEWASH BOWL WITH DUST COVER ACTIVATED BY PUSH HANDLE, 2 EYE/FACE WASH SPRAY HEADS, SHOWER AND EYE/FACEWASH REGULATOR VALVES, POWER COATED GALVANIZED PIPES AND FITTINGS WITH SAFETY COATING, STAINLESS STEEL SHOWER PULL ROD, STAINLESS STEEL PUSH HANDLE, ANSI COMPLIANT SIGN, FLOW SWITCH AND AP275-205 (DOUBLE POLE/DOUBLE THROW) ELECTRIC LIGHT AND ALARM HORN.	-	-	-	-	-	-	-	-	1 1/4" (TEPID)	1 1/4" (TEPID)
FD-1	FLOOR DRAIN	ZURN - MODEL ZN415-BZ1 FLOOR DRAIN - CAST IRON WITH 5" ADJUSTABLE POLISHED NICKEL BRONZE HEEL-PROOF STRAINER, INVERTIBLE MEMBRANE CLAMP, ADJUSTABLE COLLAR WITH SEEPAGE SLOTS, SEDIMENT BUCKET AND TRAP. PROVIDE WITH 1/2" TRAP PRIMER CONNECTION ON INLET SIDE OF P-TRAP BELOW FLOOR SLAB.	3	-	-	3"	3"	1 1/2"	1/2"	-	-	-
FD-2	FLOOR DRAIN	ZURN - MODEL Z415C FLOOR DRAIN - CAST IRON WITH 5", NICKEL BRONZE TYPE C LIGHT DUTY HINGED STRAINER, INVERTIBLE MEMBRANE CLAMP, ADJUSTABLE COLLAR WITH SEEPAGE SLOTS AND TRAP. PROVIDE WITH 1/2" TRAP PRIMER CONNECTION ON INLET SIDE OF P-TRAP BELOW FLOOR SLAB.	2	-	-	2"	2"	2"	1/2"	-	-	-
FD-3	FLOOR DRAIN	ZURN - MODEL Z526 FLOOR DRAIN - CAST IRON WITH 12" HEAVY DUTY TRACTOR GRATE, ADJUSTABLE EXTENSION FRAME, INVERTIBLE MEMBRANE CLAMP, SEEPAGE SLOTS AND TRAP. PROVIDE WITH 1/2" TRAP PRIMER CONNECTION ON INLET SIDE OF P-TRAP BELOW FLOOR SLAB.	3	-	-	3"	3"	1 1/2"	1/2"	-	-	-
FD-4	FLOOR DRAIN	ZURN - MODEL Z526 FLOOR DRAIN - CAST IRON WITH 12" MEDIUM DUTY GRATE, ADJUSTABLE EXTENSION FRAME, INVERTIBLE MEMBRANE CLAMP, SEEPAGE SLOTS AND TRAP. PROVIDE WITH 1/2" TRAP PRIMER CONNECTION ON INLET SIDE OF P-TRAP BELOW FLOOR SLAB.	4	-	-	4"	4"	2"	1/2"	-	-	-
FD-5	FLOOR DRAIN	ZURN - MODEL Z505 FLOOR DRAIN - CAST IRON WITH 12" HEAVY DUTY TRACTOR GRATE, ADJUSTABLE EXTENSION FRAME, INVERTIBLE MEMBRANE CLAMP, SEEPAGE SLOTS, SEDIMENT BUCKET AND TRAP. PROVIDE WITH 1/2" TRAP PRIMER CONNECTION ON INLET SIDE OF P-TRAP BELOW FLOOR SLAB.	4	-	-	4"	4"	4"	1/2"	-	-	-
HB-1	HOSE BIBB W.M. ASSE 1011	WOODFORD - MODEL 24 - ANTI-SIPHON HOSE BIBB - 3/4" MALE HOSE THREAD, INTEGRAL VACUUM BREAKER/BACKFLOW DEVICE, CHROME FINISH, REMOVABLE HANDLE.	-	-	-	-	-	-	3/4"	3/4"	-	-
JS-1	SERVICE SINK F.M. WITH W.H. FAUCET	STERN WILLIAMS - MODEL MTB-3624 SERVICE SINK - MARBLE CHIP AND PORTLAND CEMENT COMPOSITE, GROUTED, SEALED AND STAIN RESISTANT. INTEGRAL CAST BRASS DRAIN WITH STAINLESS STEEL STRAINER, ALUMINUM BUMPER GUARDS ON EXPOSED SIDES, 20 GAUGE TYPE 304 S.S. BACKSPLASH ON EXPOSED WALL, HOSE AND WALL HOOK, STAINLESS STEEL MOP HANGER. STERN WILLIAMS - MODEL T-15-VB - POLISHED BRASS WALL HUNG SERVICE SINK FAUCET WITH WALL BRACE, SPRING CHECKS, INTEGRAL STOPS, INTEGRAL VACUUM BREAKER, BUCKET HOOK AND HOSE FITTING.	3	2.25	2.25	3"	-	1 1/2"	1/2"	1/2"	1/2"	1/2"
JS-2	SERVICE SINK F.M. WITH W.H. FAUCET	STERN WILLIAMS - MODEL MTB-2424 SERVICE SINK - MARBLE CHIP AND PORTLAND CEMENT COMPOSITE, GROUTED, SEALED AND STAIN RESISTANT. INTEGRAL CAST BRASS DRAIN WITH STAINLESS STEEL STRAINER, ALUMINUM BUMPER GUARDS ON EXPOSED SIDES, 20 GAUGE TYPE 304 S.S. BACKSPLASH ON EXPOSED WALL, HOSE AND WALL HOOK, STAINLESS STEEL MOP HANGER. STERN WILLIAMS - MODEL T-15-VB - POLISHED BRASS WALL HUNG SERVICE SINK FAUCET WITH WALL BRACE, SPRING CHECKS, INTEGRAL STOPS, INTEGRAL VACUUM BREAKER, BUCKET HOOK AND HOSE FITTING.	3	2.25	2.25	3"	-	1 1/2"	1/2"	1/2"	1/2"	1/2"
L-1	ADA LAVATORY & NON-ADA W.H., H.C.C. WITH FAUCET ASME A112.19.2M ANSI A117.1, ASSE 1070	AMERICAN STANDARD, LUCERNE MODEL 0356.421, VITREOUS CHINA, SINGLE HOLE, FRONT OVERFLOW, METAL GRID DRAIN, CONCEALED ARMS, WALL MOUNTED. DELTA FAUCET, PARADIGM SELECTRONIC, ABOVE DECK REMOVABLE MIXING HANDLE, HARD-WIRED SENSOR POWER KIT, VANDAL RESISTANT 0.5 GPM AERATOR, CAST ONE PIECE CONSTRUCTION, HARDWIRED OPERATION SENSOR TYPE ACTIVATION, CHROME-PLATED ADA OFF-SET P-TRAP, CHROME-PLATED TAILPIECE, CHROME-PLATED HOT AND COLD WATER STOPS AND SUPPLIES. MOUNT RIM AT ADA HEIGHT FOR ADA ACCESSIBLE UNIT. LAV GUARD TRAP WRAP ON ALL EXPOSED PIPES AND FITTINGS.	1 1/2	1	1	1 1/4"	1 1/4"	1 1/4"	3/8"	1/2"	3/8"	1/2"
SH-1	ACCESSIBLE SHOWER ASME A112.18.1, ASSE 1016, ANSI Z124.2	FREEDOM, MODEL APF6033BF5PLR, 60"x33-3/8"x78" FIBERGLASS WITH ACRYLIC FINISH SHOWER, FULL WALL REINFORCEMENT, SELF-SUPPORTING / PRE-LEVELED SHOWER BASE, TEXTURED SLIP-RESISTANT FLOOR. FACTORY INSTALLED FOLDING SHOWER SEAT, GRAB BARS, SHOWER ROD, SOAP DISH. PROVIDE ZURN 2" SHOWER DRAIN. DELTA MODEL T1725 PRESSURE BALANCING MIXING VALVE WITH ADA COMPLIANT LEVER HANDLE, INTEGRAL STOPS, ADJUSTABLE STOP SCREW, MAXIMUM 2.0 GPM, WALL MOUNTED SHOWER HEAD, DELTA 51552 HANDSHOWER, 24" WALL BAR WITH ADJUSTABLE SLIDE AND 60" METAL HOSE,	2	3	3	2"	2"	1 1/2"	1/2"	1/2"	1/2"	1/2"
SS-1	SHOP SINK F.M. WITH FAUCET	ADVANCE TABCO - MODEL 6-81-18 - SCULLERY SINK - #16 GAUGE, TYPE 300 STAINLESS STEEL, OVERALL 21-1/2" SQUARE FREE STANDING, 18"x18"x14" DEEP ONE COMPARTMENT, 8" HIGH BACKSPLASH, GALVANIZED LEGS WITH PLASTIC BULLET FEET. ADVANCE TABCO - MODEL K-1118 SPLASH MOUNTED HEAVY DUTY FAUCET, 2.2 GPM, CHROME-PLATED BRASS CONSTRUCTION, 8" SWING SPOUT, LEVER HANDLES, CHROME-PLATED BRASS DRAIN OUTLET, STAINLESS STEEL BASKET STRAINER, CHROME-PLATED P-TRAP WITH CLEANOUT, CHROME-PLATED TAILPIECE, CHROME-PLATED HOT AND COLD STOPS WITH SUPPLIES.	3	2.25	2.25	3"	-	1 1/2"	1/2"	1/2"	1/2"	1/2"
TP-1	TRAP PRIMER	PPP (PRECISION PLUMBING PRODUCTS) - MODEL MP-500-115V MINI-PRIME ELECTRONIC TRAP PRIMING MANIFOLD WITH AIR GAP FITTING, SOLENOID VALVE, RECYCLE TIMER BOX, DU SERIES DISTRIBUTION UNIT WITH 1/2" OUTLETS (1 PER EACH FLOOR DRAIN SERVED).	-	-	-	-	-	-	1/2"	1/2"	-	-
TP-2	TRAP PRIMER	PPP (PRECISION PLUMBING PRODUCTS) - MODEL MPB-500-115V MINI-PRIME ELECTRONIC TRAP PRIMING MANIFOLD WITH AIR GAP FITTING, SOLENOID VALVE, RECYCLE TIMER BOX, DU SERIES DISTRIBUTION UNIT WITH 1/2" OUTLETS (1 PER EACH FLOOR DRAIN SERVED) AND MOUNTING BOX WITH LOCKING COVER.	-	-	-	-	-	-	1/2"	1/2"	-	-
UR-1	ADA URINAL W.H., H.C.C. ASME A112.19.2, ANSI A117.1	AMERICAN STANDARD - MODEL WASHBROOK FLOWISE - URINAL - VITREOUS CHINA, WASHOUT FLUSH, 1.0 GPF, 3/4" INLET SPUD, 2 WALL HANGERS. PROVIDE ZURN ZEMS6003PL-IS-WS1 HARDWIRED SENSOR TYPE FLUSH VALVE WITH MANUAL PUSHBUTTON OVERRIDE. MOUNT PER ADA REQUIREMENTS.	2	5	-	INTEGRAL	2"	1 1/2"	3/4"	3/4"	-	-
VB-1	ICE MAKER VALVE BOX RECESSED W.M.	GUY GRAY - MIB SERIES - ICE MAKER OUTLET BOX - 18 GAUGE FACEPLATE AND BOX, WHITE POWDER COAT ON COLD ROLLED STEEL FINISH, BRASS QUARTER TURN HAMMER ARRESTOR LEAD FREE VALVE. MOUNT PER REFRIGERATOR MANUFACTURER'S RECOMMENDATIONS.	-	-	-	-	-	-	1/2"	-	-	-
WC-1	WATER CLOSET F.M., F.V. ASME A112.19.2	AMERICAN STANDARD - MADERA FLOWISE, 1.6 GPF, ELONGATED BOWL - FLOOR MOUNTED. WHITE VITREOUS CHINA, SIPHON JET FLUSH ACTION, 15" RIM. PROVIDE ZURN ZEMS6000AV-2-IS-WS1 HARDWIRED SENSOR TYPE FLUSH VALVE WITH MANUAL PUSHBUTTON OVERRIDE. PROVIDE ZURN POWER KIT. AMERICAN STANDARD #5901.100 ELONGATED HEAVY DUTY TOILET SEAT.	6	10	-	INTEGRAL	4"	2"	1"	1 1/4"	-	-
WC-1A	ADA WATER CLOSET F.M., F.V., H.C.C. ASME A112.19.2 ANSI A117.1, ADA	AMERICAN STANDARD - MADERA FLOWISE, 1.6 GPF, ELONGATED BOWL - FLOOR MOUNTED. WHITE VITREOUS CHINA, SIPHON JET FLUSH ACTION, 16-1/2" RIM. PROVIDE ZURN ZEMS6000AV-2-IS-WS1 HARDWIRED SENSOR TYPE FLUSH VALVE WITH MANUAL PUSHBUTTON OVERRIDE.. PROVIDE ZURN POWER KIT. AMERICAN STANDARD #5901.100 ELONGATED HEAVY DUTY TOILET SEAT. MOUNT AT ADA HEIGHT.	6	10	-	INTEGRAL	4"	2"	1"	1 1/4"	-	-
WH	FREEZE-PROOF WALL HYDRANT RECESSED W.M.	ZURN - MODEL Z1300 - WALL HYDRANT - ENCASED, NON-FREEZE BACKFLOW PREVENTER,, ANTI-SIPHON, AUTOMATIC DRAINING, NICKEL BRONZE RECESSED WALL BOX WITH HINGED COVER FLUSH WITH EXTERIOR WALL, OPERATING KEY LOCK, "WATER" CAST ON COVER. INSTALL 24" AFG.	-	-	-	-	-	-	3/4"	3/4"	-	-

ABBREVIATIONS: F.V.-FLUSH VALVE F.M.-FLOOR MOUNTED F.T.-FLUSH TANK W. M.-WALL MOUNTED W.H.-WALL HUNG C.T.M.-COUNTER TOP MOUNTED F.P.C.-FOOT PEDAL CONTROL H.C.C.-HANDICAPPED ACCESS CONTROLS S.S.-CORROSION RESISTANT STEEL GPM-GALLONS PER MINUTE C/H-COLD & HOT W.P.-WASTE PIPE V.P.-VENT PIPE C.W.-COLD WATER H.W.-HOT WATER 105 W-TEMPERED WATER, D.B.-DRAIN BOARD F.P.-FREEZE-PROOF F.C.V.-FLOW CONTROL VALVE H.C.M.-HANDICAPPED MOUNTING HEIGHT H.E.T.-HIGH EFFICIENCY TOILET

* UNLESS OTHERWISE NOTED.

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Charleston, West Virginia

PLUMBING
PLUMBING SCHEDULES

CORY SHARRARD REGISTERED 28726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	MAS
DESIGNED BY:	MAS
CHECKED BY:	CVS
SHEET NO.	REVISION
P-600	A

GAS WATER HEATER (DWH) SCHEDULE

MARK	ITEM	LOCATION	TYPE	STORAGE IN GALLONS	LWT	MBH INPUT	ELEC INPUT	RATE / AT °F RISE	MIN. EFF %	REMARKS
DWH-1-1	WATER HEATER	WHSE-MECH RM 109	NATURAL GAS	100	140°F	199,900	120V/5A/15 MOP	235 GPH / 100	95%	1,2,4,5,6,7
DWH-3-1	WATER HEATER	MAIL BLDG-MECH RM 103	NATURAL GAS	40	140°F	38,000	120V/5A/15 MOP	41/90	-	1,3,4,5,8

REMARKS:
1. SEE SPECIFICATIONS FOR EQUIPMENT STANDARDS AND MANUFACTURERS.
2. A.O.SMITH BTH-120(A) USED AS BASIS OF DESIGN.
3. A.O.SMITH GDV-40 USED AS BASIS OF DESIGN
4. BASIS OF DESIGN ENTERING WATER TEMPERATURE IS 40°F.
5. PROVIDE T & P VALVE, ROUTE TO NEAREST FLOOR DRAIN.
6. PROVIDE 4" CONCENTRIC VENT KIT.
7. PROVIDE CONDENSATE NEUTRALIZATION KIT.
8. DIRECT VENT - ONE-PIPE, DUAL-CHANNEL CLOSED SYSTEM

EXPANSION TANK (EXT) SCHEDULE

MARK	SERVICE	LOCATION	TYPE	TANK VOLUME	ACCEPTANCE FACTOR	MAX PRESS	MEAN OPERATING TEMP	REMARKS
EXT-1-1	1	WHSE-MECH RM 109	1,2	6	.50	150 PSIG	140°F	1,2,3
EXT-3-1	1	MAIL BLDG-MECH RM 103	1,2	2	.45	150 PSIG	140°F	1,2,3

SERVICE:
1. DOMESTIC HOT WATER

TYPE:
1. VERTICAL BLADDER
2. COMMERCIAL ASME

REMARKS:
1. PROVIDE SUPPORT FROM STRUCTURE.
2. SEE SPECIFICATIONS FOR FIXTURE STANDARDS AND MANUFACTURERS.
3. AMTROL THERM-X-TROL USED AS BASIS OF DESIGN.

PLUMBING PUMP (PP) SCHEDULE

MARK	LOCATION	SERVICE	FLUID		PUMP PERFORMANCE			MOTOR			REMARKS
			FLUID	TEMP	SP GR	FLOW GPM	TOTAL HEAD	V/PH/HZ	WATTS/AMPS	TYPE	
PP-1-1	WHSE-MECH 109	DOMESTIC	WATER	140°	1.0	2.5	8.0	115/1/60	VARIABLE 4-60	CIRCULATOR	1,2,3,4
PP-1-2	WHSE-MECH 109	EEWS-1s	WATER	140°	1.0	2.5	5.0	115/1/60	VARIABLE 4-60	CIRCULATOR	1,2,3,4
PP-3-1	MAIL RM - MECH 103	DOMESTIC	WATER	140°	1.0	1.0	2.0	115/1/60	VARIABLE 4-60	CIRCULATOR	1,2,3,4

REMARKS:
1. SEE SPECIFICATIONS FOR EQUIPMENT STANDARDS AND MANUFACTURERS.
2. BELL & GOSSETT - ZYLEM BRAND - MODEL ECOCIRC 19-16 - 3/4" - LEAD-FREE STAINLESS STEEL BODY - USED AS BASIS OF DESIGN.
3. FACTORY SUPPLIED CHECK VALVE.
4. MOUNT PUMP ON WALL 4'-6" AFF.

THERMOSTATIC MIXING VALVE (TMV) SCHEDULE

MARK	LOCATION	CAPACITY GPM	MIN. FLOW GPM	COLD WATER EWT (°F)	HOT WATER EWT (°F)	HOT WATER LWT (°F)	REMARKS
TMV-1-1	WHSE - MECH RM 109	30	2.50	40	140	120	1,2,6,10
TMV-1-2	WHSE - MECH RM 109	50	2.50	40	140	70	1,3,6,10
TMV-1-3	WHSE - MEN'S RR 114	3.6	0.25	40	120	105	1,4,7,10
TMV-1-4	WHSE - WOMEN'S RR 113	3.6	0.25	40	120	105	1,4,7,10
TMV-1-5	SHOWER ROOM 115	9.5	0.25	40	120	110	1,5,8,10
TMV-1-6	WHSE - BREAKROOM 118	9.5	0.25	40	120	110	1,5,9,10
TMV-3-1	MAIL RM - MECH RM 103	9.5	0.25	40	140	110	1,5,6,10
TMV-3-2	MAIL RM - RR 106	3.6	0.25	40	110	105	1,4,7,10
TMV-3-3	MAIL RM - RR 107	3.6	0.25	40	110	105	1,4,7,10

REMARKS:
1. SEE SPECIFICATIONS FOR EQUIPMENT STANDARDS AND MANUFACTURERS.
2. LEONARD MODEL LV-981-LF-3/4" ECO-MX THERMOSTATIC MIXING VALVE WITH WALL SUPPORT USED AS BASIS OF DESIGN.
3. LEONARD MODEL TM-850-LF STSTL-EXP SAFETY STATION MIXING VALVE USED AS BASIS OF DESIGN.
4. LEONARD MODEL 170-LF STSTL-REC USED AS BASIS OF DESIGN.
5. LEONARD MODEL 270-LFSTSTL-REC USED AS BASIS OF DESIGN.
6. PROVIDE MOUNTED TO WALL @ 4'-6" A.F.F.
7. INSTALL BELOW LAVATORY.
8. INSTALL IN WALL AT 7'-0" AFF.
9. INSTALL IN SINK BASE CABINET.
10. PROVIDE WITH THERMOMETER ON WATER OUTLET.

WATER HAMMER ARRESTOR SCHEDULE (WHA)

PDI SYMBOL	WHA-A	WHA-B	WHA-C	WHA-D	WHA-E	WHA-F
FIXTURE UNIT RATING	1 to 11	12 to 32	33 to 60	61 to 113	114 to 154	155 to 330
PIPE CONNECTION	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"

REMARKS: PROVIDE PER PDI WH-201 - TABLE BASED ON 50' PIPE LENGTH.

BACKFLOW PREVENTER SCHEDULE

MARK	SERVICE	LOCATION	TYPE	SIZE	REMARKS	ACCESSORIES
BFP-1-1	POTABLE WATER	WHSE - SPRINKLER	1	2"	1,2	1,2
BFP-1-2	POTABLE WATER	WHSE - SHOP 126	2	3/4"	1,3	1
BFP-3-1	POTABLE WATER	MAIL ROOM BLDG	1	2"	1,2	1,2

TYPE:
1. REDUCED PRESSURE ZONE
2. DOUBLE CHECK VALVE ASSEMBLY

ACCESSORIES:
1. PROVIDE WITH STRAINER.
2. PROVIDE WITH AIR GAP FITTING.

REMARKS:
1. SEE SPECIFICATIONS FOR VALVE STANDARDS AND MANUFACTURERS.
2. ZURN MODEL 975XL2 USED AS BASIS OF DESIGN.
3. ZURN MODEL 350XL USED AS BASIS OF DESIGN.

HOSE REEL SCHEDULE

MARK	SERVICE	LOCATION	TYPE	SIZE	REMARKS	ACCESSORIES
HR-1-1	DOMESTIC WATER	WAREHOUSE-SEE PLANS	1	SEE SPECS	1,2	1,2,3
HR-1-2	COMPRESSED AIR	WAREHOUSE-SEE PLANS	1	SEE SPECS	1,2	1,3,4

TYPE:
1. RETRACTABLE

ACCESSORIES:
1. SHUT-OFF VALVE
2. AIR GAP FITTING
3. 50' HOSE
4. QUICK DISCONNECT

REMARKS:
1. MUST BE FROM SINGLE MANUFACTURER
2. REELCRAFT MODEL 7850 OLP USED AS BASIS DESIGN.

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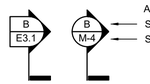
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Charleston, West Virginia

PLUMBING
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DESIGNED BY:	MAS
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SHEET NO.	REVISION
P-601	△

GENERAL LEGEND



APPEARS ON SHEET WHERE SECTION IS CUT
SECTION IDENTIFICATION LETTER
SHEET WHERE SECTION IS DRAWN



APPEARS ON THE SHEET WHERE SECTION IS DRAWN
SECTION OR DETAIL IDENTIFICATION LETTER
SHEET WHERE DRAWN



PLAN MATCH LINE SYMBOL



ROOM NUMBER



CEILING HEIGHT

AFF — ABOVE FINISHED FLOOR

TOP, BOP — TOP OF PIPE, BOTTOM

BOD — BOTTOM OF DUCT

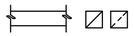
HVAC LEGEND



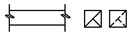
NEW DUCT - 1ST FIGURE IS DIMENSION SHOWN



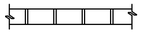
SUPPLY OR OUTSIDE AIR DUCTWORK; PLAN - UP & DOWN



RETURN DUCTWORK; PLAN - UP & DOWN



EXHAUST DUCTWORK; PLAN - UP & DOWN



DROP AND RISE IN DIRECTION OF FLOW



ACOUSTIC LINED DUCTWORK; PLAN

SUPPLY AIR DUCT

OUTSIDE AIR DUCT

RETURN AIR DUCT

EXHAUST AIR DUCT

TRANSFER AIR DUCT

HIGH VELOCITY SUPPLY DUCT (MEDIUM PRESSURE)

F/O — FLAT OVAL DUCT



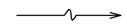
LOW PRESSURE FLEXIBLE DUCT



HIGH PRESSURE FLEXIBLE DUCT



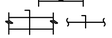
ROUND DUCTWORK; PLAN, UP AND DOWN



AIR FLOW; DIRECTION



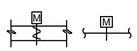
REHEAT COIL IN DUCT



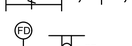
MANUAL VOLUME DAMPER; PLAN, ONE LINE DIAGRAM



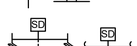
BACKDRAFT DAMPER



MOTOR OPERATED DAMPER; PLAN, ONE LINE DIAGRAM



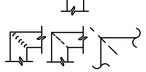
FIRE DAMPER



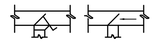
SMOKE DAMPER; PLAN, ONE LINE DIAGRAM
(FIRE/SMOKE - FSD)



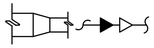
SPLITTER DAMPER: SD; SHOWN IN TEE WITH
TURNING VANES.



AIR TURNING VANES; PLAN, ONE LINE DIAGRAM



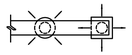
DUCT BRANCH TAKE OFF WITH RAKE OFF DAMPER;
PLAN, ONE DIAGRAM



DUCT TRANSITION; PLAN, ONE LINE DIAGRAM



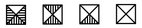
ACCESS DOOR, VERTICAL OR HORIZONTAL



CEILING DIFFUSERS



DUCT OR PIPE SECTION



SUPPLY DIFFUSER; ONE, TWO, THREE AND FOUR WAY



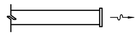
RETURN OR TRANSFER GRILLE



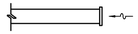
RETURN GRILLE WITH ACOUSTIC BAFFLE



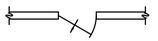
EXHAUST GRILLE



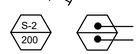
SUPPLY WALL REGISTER



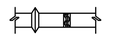
EXHAUST OR RETURN WALL REGISTER OR GRILLE



DOOR GRILLE

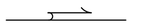


AIR DEVICE DESIGNATION.
(S) SUPPLY, (R) RETURN, (E) EXHAUST, (T) TRANSFER,
(L) LOUVER; I.E. SUPPLY TYPE 2, 200 C.F.M.



FLEXIBLE DUCT CONNECTOR; PLAN, ONE LINE DIAGRAM

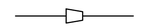
A DIRECTION OF PIPE FLOW



DIRECTION OF PIPE PITCH

REFRIGERANT SUCTION PIPING

REFRIGERANT LIQUID PIPING

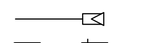


REDUCING BUSHING

CAP



PLUG



90° ELBOW

90° ELBOW TURNED UP

90° ELBOW TURNED DOWN

45° ELBOW



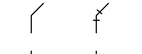
TEE OR SIDE CONNECTION



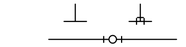
TEE OUTLET UP



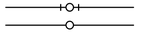
TEE OUTLET DOWN



CROSS

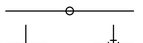


UNCONNECTED CROSSING PIPES



RISE OR DROP IN PIPE

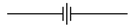
BOTTOM CONNECTION TO LINE



TOP CONNECTION TO LINE



RISER IN SLEEVE



UNION



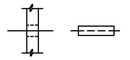
STRUCTURAL PIPE ANCHOR



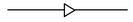
BUILDING ENTRANCE PIPE ANCHOR

PIPE GUIDE

EXPANSION JOINT



WALL SLEEVE



CONCENTRIC REDUCER

ECCENTRIC REDUCER



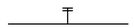
THROUGH ROOF



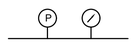
THROUGH FLOOR



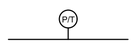
THROUGH WALL



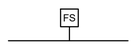
THERMOMETER WELL



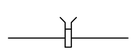
PRESSURE GAUGES



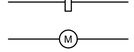
PRESSURE/TEMPERATURE TEST PLUG



FLOW SWITCH



ORIFICE FLOW METER

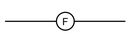


METER: WATER, CONDENSATE OR GAS

POT OR SHOT FEEDER

THERMOSTAT, OR TEMP. CONTROLLER

PRESSURE CONTROLLER



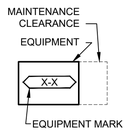
HUMIDISTAT, OR HUM. CONTROLLER

CARBON MONOXIDE DETECTOR



NITROUS OXIDE DETECTOR

SWITCH



GENERAL NOTES

1. GENERAL NOTES, WHEREVER THEY ARE FOUND, APPLY TO ALL WORK IN THE PROJECT, UNLESS OTHERWISE INDICATED. SHEET NOTES, UTILIZING NOTE SYMBOLS, APPLY ONLY TO THE SHEET ON WHICH THEY ARE FOUND, UNLESS OTHERWISE STATED. THE MEANING OF NOTE SYMBOLS AND NUMBERS VARIES FROM SHEET TO SHEET.
2. CONTRACTOR WILL UTILIZE ALL INFORMATION IN THE CONTRACT DOCUMENTS FOR PROVIDING THE WORK. CONTRACTOR WILL UTILIZE DETAILS AND FLOW DIAGRAMS FOR THE WORK WHERE APPROPRIATE.
3. CONTRACTOR WILL FIELD-VERIFY ALL EXISTING CONDITIONS. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONTRACT DOCUMENTS WILL BE BROUGHT TO THE ATTENTION OF THE CONTRACTING OFFICER BEFORE ANY WORK RELATING TO THOSE CONDITIONS IS PERFORMED.
4. PROVIDE AND INSTALL ALL EQUIPMENT AND ACCESSORIES AS INDICATED, IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
5. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM CONFORMING TO ALL REQUIREMENTS OF THE CURRENT BUILDING CODES OF WEST VIRGINIA:

   2015 INTERNATIONAL BUILDING CODE
   2016 WEST VIRGINIA STATE BUILDING CODE
   2015 INTERNATIONAL FUEL GAS CODE
   2015 INTERNATIONAL MECHANICAL CODE
   2015 INTERNATIONAL PLUMBING CODE
   2015 EDITION OF THE NATIONAL FIRE CODES
   2016 WEST VIRGINIA STATE FIRE CODE
   2010 EDITION OF ASHRAE STANDARD 90.1

   CONTRACTOR IS RESPONSIBLE FOR MAKING ALL REQUIRED CONNECTIONS FOR A COMPLETE SYSTEM.
6. CONTRACTOR SHALL MAINTAIN A SET OF PROJECT RECORD DRAWINGS AT THE JOB SITE AND SHALL BE RESPONSIBLE FOR MAKING CLEAR CHANGES TO THE DRAWINGS, REFLECTING CHANGES TO THE WORK AND VARIANCE IN EXISTING CONDITIONS.
7. CONTRACTOR WILL PROVIDE ALL MISCELLANEOUS STEEL TO SUPPORT ALL MECHANICAL DUCT AND PIPING SYSTEMS AND EQUIPMENT. HANG ALL EQUIPMENT FROM STRUCTURE WITH MINIMUM OF TWO TRAPEZE ASSEMBLIES OR FOUR INTEGRAL MOUNTING POINTS WITH HOUSED SPRING VIBRATION ISOLATORS ON ALL FOUR SUPPORTS. DO NOT HANG ANYTHING FROM OTHER MECHANICAL OR ELECTRICAL ITEMS.
8. NO STEEL STRUCTURAL MEMBERS WILL BE CUT, BURNED, WELDED OR DRILLED WITHOUT SPECIFIC PERMISSION OF THE STRUCTURAL ENGINEER.
9. ALL EQUIPMENT, DUCT, PIPING AND ACCESSORIES INSTALLED OUTSIDE OR OTHERWISE EXPOSED TO THE ELEMENTS WILL BE ADEQUATELY WEATHERPROOFED, IN KEEPING WITH THE SPECIFICATIONS. ALL FERROUS METAL FRAMING COMPONENTS WILL BE STAINLESS STEEL OR HOT-DIP GALVANIZED.
10. ALL EQUIPMENT, ACCESSORIES, PIPING, WIRING, DUCT AND OTHER WORK, WHICH IS INSTALLED IN FINISHED SPACES WILL BE CONCEALED IN WALLS, FLOORS, FURRED CHASES OR SUSPENDED CEILINGS, EXCEPT FOR INDICATED TERMINAL UNITS, CONTROLS, AIR INLETS AND OUTLETS, AS SHOWN.
11. PROVIDE ALL ACCESS DOORS AS SHOWN, EXCEPT THOSE SPECIFIED UNDER OTHER DIVISIONS. IN ADDITION, PROVIDE ANY OTHER ACCESS DOORS - WHETHER OR NOT SHOWN ON PLANS - NECESSARY FOR ACCESS TO CONCEALED EQUIPMENT, VALVES, DAMPERS, ACTUATORS, JUNCTION BOXES, CONTROLS OR OTHER OPERATIONAL OR SERVICEABLE ITEMS, UNLESS ITEM IS REASONABLY ACCESSIBLE THROUGH LAY-IN CEILING PANELS.
12. DUCT DAMPERS IN INACCESSIBLE CEILINGS MAY BE PROVIDED WITH APPROVED REMOTE OPERATORS INSTEAD OF ACCESS DOORS.
13. DO NOT CHANGE PATH OF PIPING OR DUCT RUNS, ADD TURNS OR OFFSETS OR CHANGE DUCT DIMENSIONS OR PIPE SIZE WITHOUT FIRST CONSULTING THE ENGINEER. PIPE SIZES SHOWN ON DRAWINGS ARE NOMINAL UNLESS OTHERWISE INDICATED. ALL DUCT SIZES SHOWN ON PLANS ARE CLEAR INSIDE DIMENSIONS FOR SHOP OR FIELD-FABRICATED DUCT AND NOMINAL SIZES FOR FACTORY FABRICATED DUCT.
14. SEE ALSO RISER DIAGRAMS OR FLOW/CONTROL DIAGRAMS FOR SIZES NOT SHOWN ON PLANS.
15. FOR TYPICAL WATER, REFRIGERANT, GAS AND AIR CONNECTIONS TO EQUIPMENT, SEE STANDARD DETAILS.
16. ALL EXTERIOR MECHANICAL UTILITIES WILL BE IN GENERAL COMPLIANCE WITH APPROPRIATE DIVISION 23 SPECIFICATION SECTION (FOR CORRESPONDING INTERIOR UTILITIES).
17. COORDINATE ALL PIPING AND DUCTWORK WITH MECHANICAL AND ELECTRICAL WORK, INCLUDING HVAC, PLUMBING, ELECTRICAL, FIRE ALARM, SPRINKLER, COMMUNICATIONS AND EXTERIOR UTILITIES.
18. PROVIDE DISCONNECTS AND MAGNETIC STARTERS (OR RELAYS WITH OVERLOAD PROTECTION FOR SINGLE PHASE) FOR ALL EQUIPMENT SUPPLIED UNDER DIVISION 23 WHICH IS SPECIFIED TO HAVE FACTORY CONTROL PANEL. POWER WIRING AND CONDUIT TO THESE DEVICES AND BETWEEN THESE DEVICES AND MECHANICAL EQUIPMENT, IF REQUIRED, WILL BE SUPPLIED UNDER DIVISION 26.
19. LOCATIONS OF DUCTWORK AND EQUIPMENT, AS INDICATED ON THE DRAWING, ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD. WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID INTERFERENCE.
20. CONDENSATE DRAINS SHALL BE SUPPLIED FOR ALL COOLING EQUIPMENT. CONTRACTOR SHALL INSURE PROPER INSTALLATION AND DRAINAGE AS REQUIRED BY FEDERAL, STATE AND LOCAL CODES. CONDENSATE PIPING SHALL BE TYPE "L" COPPER.
21. AIRFLOWS (CFM) INDICATED ON DIFFUSER TAGS CORRESPOND TO COOLING MODE OPERATIONS.
22. ALL MITERED ELBOWS 45° OR GREATER SHALL BE PROVIDED WITH TURNING VANES. WHERE SPACE PERMITS USE RADIUS TYPE WITH CENTERLINE R=1.5 W.
23. VOLUME DAMPERS SHALL BE PROVIDED IN BRANCH DUCTS OR AT EACH INDIVIDUAL DUCT GRILLE, REGISTER, OR DIFFUSER.

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

AIRPORT PLANNING / DEVELOPMENT
ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING

St. Albans, WV
(304) 727-5501

Buckhannon, WV
(304) 472-8914

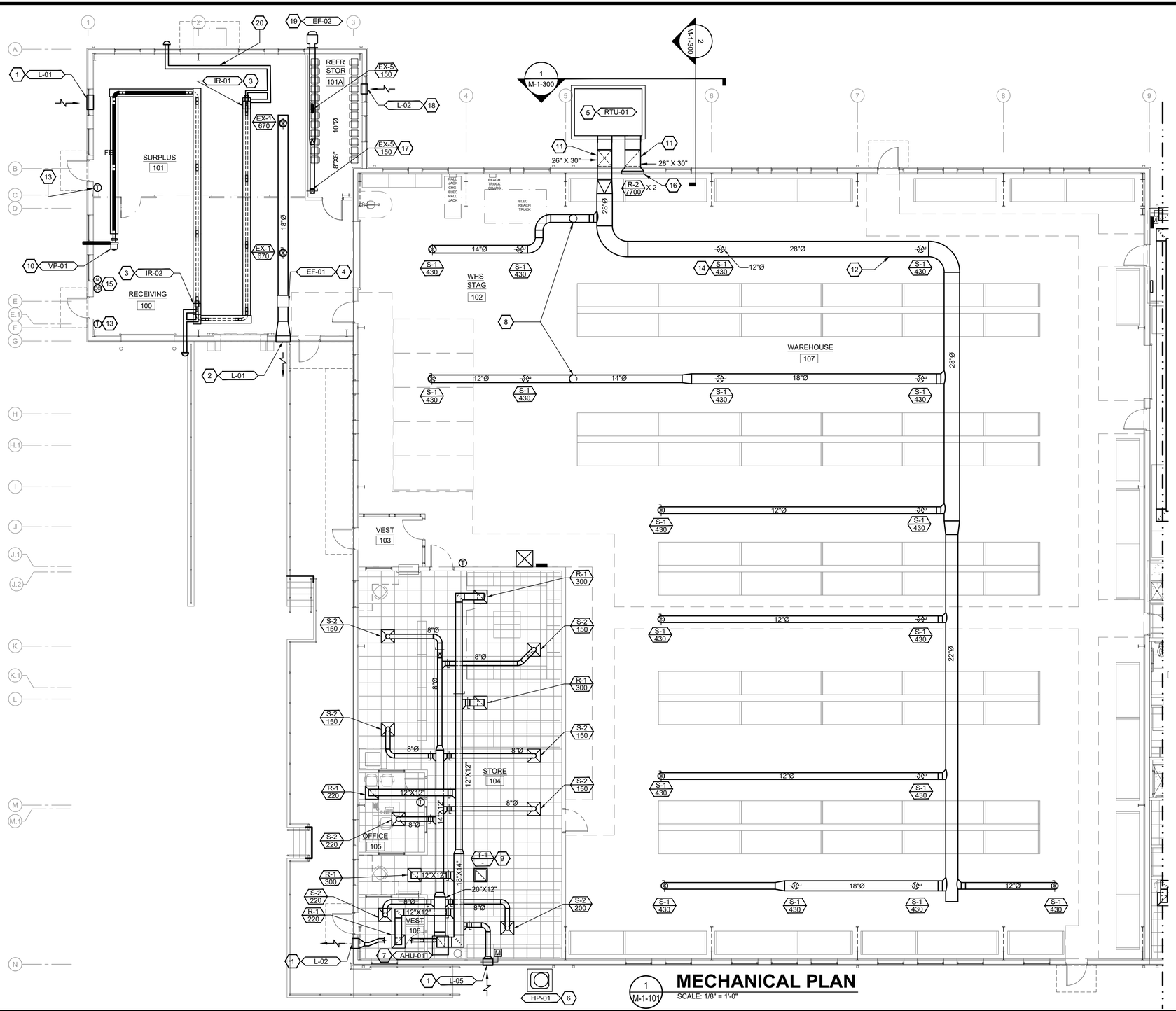
www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

MECHANICAL
LEGENDS AND GENERAL NOTES

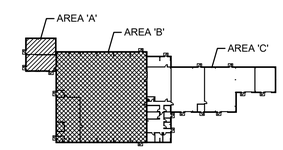
CORY SHARRARD REGISTERED 28726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
8/31/21

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	XXX
DESIGNED BY:	CVS
CHECKED BY:	CVS
SHEET NO.	REVISION
M-001	



SHEET KEYNOTES:

1. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 11'-0" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
2. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 12'-1" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
3. FURNISH AND INSTALL INFRARED HEATER. INFRARED HEATER BURNER, WITH 4" RADIANT TUBING WITH STAINLESS STEEL COUPLING AND PORCELAIN COATED TAIL PIPE FOR VENTING WITH STAINLESS STEEL COUPLING. PITCH (TO VACUUM PUMP) AS FOLLOWS:- RADIANT TUBING 1/4" PER 20'-0", TAILPIPE 1/2" PER 20'-0". GAS SERVICE REQUIRED TO EACH BURNER AT 1/2 PSI MAX. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL AS HIGH AS POSSIBLE UNDER STRUCTURE. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFER TO SHEET P-1-101 AND P-1-103 FOR MORE DETAILS ON GAS AND CONDENSATE PIPING
4. FURNISH AND INSTALL INLINE EXHAUST FAN. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. MOUNT AS HIGH AS POSSIBLE FROM STRUCTURE
5. FURNISH AND INSTALL GAS FIRED GROUND MOUNTED ROOF TOP UNIT. MOUNTED ON TOP OF 6" HOUSEKEEPING PAD. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFER TO SHEET P-1-103 FOR MORE DETAILS ON GAS PIPING
6. FURNISH AND INSTALL DX CONDENSING UNIT GROUND MOUNTED. MOUNTED ON TOP OF 6" HOUSEKEEPING PAD. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFER TO PIPING SHEETS FOR MORE DETAIL. REFRIGERANT PIPING TO CONNECT CONDENSING UNIT TO INDOOR GAS FIRED AIR HANDLING UNIT.
7. FURNISH AND INSTALL INDOOR CEILING MOUNTED GAS FIRED AIR HANDLING UNIT. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFER TO SHEET P-1-103 FOR MORE DETAILS ON GAS PIPING. REFRIGERANT PIPING TO CONNECT CONDENSING UNIT TO INDOOR GAS FIRED AIR HANDLING UNIT.
8. TURN DUCT WORK DOWN TO 12 FEET DUE TO CHANGE IN BUILDING ELEVATIONS
9. A TRANSFER GRILLE IN CEILING TO SUPPORT COMBUSTION AIR IN CEILING MOUNTED GAS FIRED INDOOR UNIT.
10. FURNISH AND INSTALL VACUUM PUMP TO VENT IR BURNER FLU GAS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
11. DUCT WORK FROM RTU, TRANSITIONS, TURNS UP AND PENETRATES THROUGH THE EXTERNAL WALL. SEE SECTION ON SHEET M-1-300 FOR MORE INFORMATION.
12. INSTALL DUCT AS CLOSE TO THE STRUCTURE AS POSSIBLE TO GIVE ENOUGH CLEARANCE FOR STORAGE RACKS. PROVIDE WITH DOUBLE WALL INSULATION
13. MOUNT INFRARED HEATER THERMOSTATS AT 5'-0" AFF
14. DUCT WORK TO DROP DOWN 1 FEET BEFORE CONNECTING TO GRD. CONNECTION OF DUCT/GRILLE, TYPICAL
15. PROVIDE AND INSTALL CO AND NOx SENSOR WITH AUDIBLE AND VISUAL ALARM (ARMSTRONG MONITORING AMC-1AVCS OR EQUAL). MOUNT SENSOR AT MANUFACTURER'S RECOMMENDED HEIGHT.
16. FURNISH AND INSTALL TWO SIDEWALL RETURN GRILLE AT 21' AFF TO BOTTOM OF LOWEST GRILLE. THE TWO SIDEWALL RETURN GRILLE WILL BE STACKED VERTICALLY ON TOP OF EACH OTHER.SEE SECTION ON SHEET M-1-300 FOR MORE INFORMATION.
17. DUCT WORK FROM TRANSITIONS, TURNS DOWN AND GRILLE IS DUCT MOUNTED ON THE VERTICAL RUN OF THE DUCT.
18. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 14'-0" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
19. FURNISH AND INSTALL CENTRIFUGAL WALL MOUNTED EXHAUST FAN. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. MOUNT AS HIGH AS POSSIBLE FROM STRUCTURE SO THAT THE EXHAUST DUCT IS AS CLOSE TO THE CEILING AS POSSIBLE. THIS IS TO COMPLETELY EXHAUST LEAKING FUMES THAT ARE LESS DENSE THAN AIR.
20. VERIFY MANUFACTURER ALLOWED PRESSURE DROP FOR IR HEATER AIR SUPPLY DUCT. BASIS OF DESIGN ALLOWS FOR 90'-0" EQUIVALENT DUCT LENGTH OF PRESSURE DROP WITH ELBOWS EQUIVALENT TO 10'-0" OF DUCT LENGTH FOR A 6" DIAMETER DUCT.



KEYPLAN

0' 4' 8' 16' 24'

SCALE: 1" = 8'

MECHANICAL PLAN

1 / M-1-101

SCALE: 1/8" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
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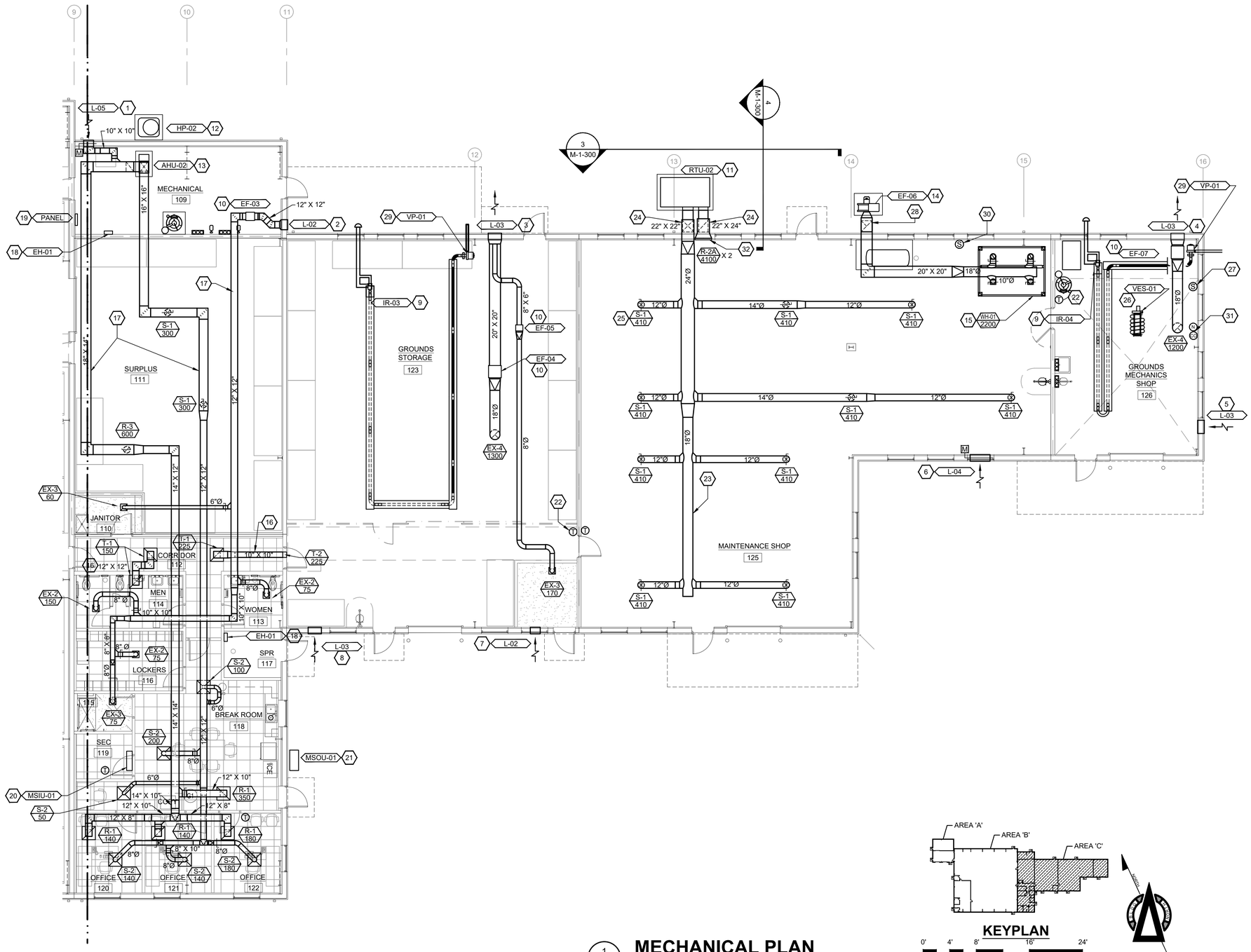
PROJECT INFORMATION

West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREAS "A" & "B"
MECHANICAL PLAN

CORY SHARRARD REGISTERED 28755 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 6/9/21

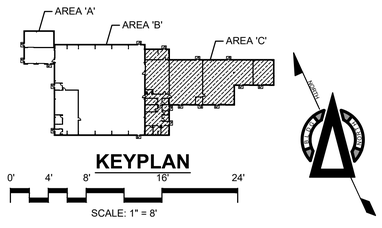
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	BM
DESIGNED BY:	CVS/BM
CHECKED BY:	CVS
SHEET NO.	REVISION
M-1-101	



SHEET KEYNOTES:

1. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 11'- 2" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
2. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 11'- 0" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
3. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 10'- 4" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
4. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 10'- 8" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
5. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 7'- 4" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
6. FURNISH AND INSTALL WALL MOUNTED LOUVER. TOP OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 10'- 0" FROM FINISHED FLOOR LEVEL. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATION
7. FURNISH AND INSTALL WALL MOUNTED LOUVER. TOP OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE EVEN WITH TOP OF DOOR. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATION. TOP OF LOUVER EVEN WITH TOP OF DOOR
8. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 13'- 0" FROM FINISHED FLOOR LEVEL AND IN LINE WITH WINDOWS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
9. FURNISH AND INSTALL INFRARED HEATER. INFRARED HEATER BURNER, WITH 4" RADIANT TUBING WITH STAINLESS STEEL COUPLING AND PORCELAIN COATED TAIL PIPE FOR VENTING WITH STAINLESS STEEL COUPLING. PITCH (TO VACUUM PUMP) AS FOLLOWS:- RADIANT TUBING 1/4"PER 20'- 0", TAILPIPE 1/2" PER 20'- 0". GAS SERVICE REQUIRED TO EACH BURNER AT 1/2 PSI MAX. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL AS HIGH AS POSSIBLE UNDER STRUCTURE. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFER TO SHEET P-1-104 FOR MORE DETAILS ON GAS PIPING
10. FURNISH AND INSTALL INLINE EXHAUST FAN. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. MOUNT AS HIGH AS POSSIBLE FROM STRUCTURE
11. FURNISH AND INSTALL GROUND MOUNTED GAS-FIRED ROOF TOP UNIT. MOUNTED ON TOP OF 6" HOUSEKEEPING PAD. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFER TO SHEET P-1-104 FOR MORE DETAILS ON GAS PIPING.
12. FURNISH AND INSTALL DX CONDENSING UNIT GROUND MOUNTED. MOUNTED ON TOP OF 6" HOUSEKEEPING PADS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.REFRIGERANT PIPING TO CONNECT CONDENSING UNIT TO INDOOR GAS FIRED AIR HANDLING UNIT.
13. FURNISH AND INSTALL INDOOR GROUND MOUNTED GAS-FIRED AIR HANDLING UNIT. MOUNTED ON TOP OF 6" HOUSEKEEPING PAD. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.REFER TO SHEET P-1-104, P-1-400 FOR MORE DETAILS ON GAS AND CONDENSATE PIPING.REFRIGERANT PIPING TO CONNECT CONDENSING UNIT TO INDOOR GAS FIRED AIR HANDLING UNIT
14. FURNISH AND INSTALL WELDING EXHAUST FAN. MOUNTED ON TOP OF 6" HOUSEKEEPING PAD. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
15. FURNISH AND INSTALL WELDING HOOD. MOUNTED BY CHAINS FROM CEILING. LOWEST POINT OF THE HOOD TO BE MOUNTED 10'- 0" FROM THE FLOOR. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
16. FURNISH AND INSTALL TRANSFER DUCT ABOVE CEILING FOR TRANSFER AIR.
17. FURNISH AND INSTALL EXPOSED DUCT IN CEILING.
18. FURNISH AND INSTALL ELECTRIC HEATER AT 8'-0" OR AS HIGH AS POSSIBLE. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
19. FURNISH AND INSTALL HVAC CONTROL PANEL. INSTALL PER MANUFACTURERS RECOMMENDATIONS
20. FURNISH AND INSTALL INDOOR MINI SPLIT UNIT MOUNTED ON THE WALL ABOVE THE DOOR. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFRIGERANT PIPING TO CONNECT CONDENSING UNIT TO INDOOR UNIT.
21. FURNISH AND INSTALL OUTDOOR MINISPLIT UNIT. MOUNTED ON TOP OF 6" HOUSEKEEPING PAD. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.REFRIGERANT PIPING TO CONNECT CONDENSING UNIT TO INDOOR UNIT
22. MOUNT INFRARED HEATER THERMOSTATS AT 5'-0" AFF
23. INSTALL DUCT AS CLOSE TO THE STRUCTURE AS POSSIBLE. PROVIDE WITH DOUBLE WALL INSULATION.
24. DUCT WORK FROM RTU, TRANSITIONS, TURNS UP AND PENETRATES THROUGH THE EXTERNAL WALL. SEE SECTION ON SHEET M-1-300 FOR MORE INFORMATION
25. DUCT WORK TO DROP DOWN 1 FEET BEFORE CONNECTING TO GRD. CONNECTION OF DUCT/GRILLE, TYPICAL.
26. FURNISH AND INSTALL VEHICLE EXHAUST SYSTEM. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS. VES TO BE CONTROLLED BY FACTORY CONTROLLER.
27. FURNISH AND INSTALL CONTROL SWITCH FOR VEHICLE EXHAUST SYSTEM. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
28. DUCT WORK FROM EXHAUST FAN TURNS UP AND PENETRATES INTO THE BUILDING AS HIGH AS POSSIBLE AND CLOSE TO STRUCTURE.
29. FURNISH AND INSTALL VACUUM PUMP TO VENT IR BURNER FLU GAS. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATION.
30. FURNISH AND INSTALL FACTORY WELDING CONTROL PANEL TO CONTROL WELDING HOOD, EF-06 AND L-04 OPERATION
31. PROVIDE AND INSTALL CO AND NOx SENSOR WITH AUDIBLE AND VISUAL ALARM (ARMSTRONG MONITORING AMC-1AVCS OR EQUAL). MOUNT SENSOR AT MANUFACTURER'S RECOMMENDED HEIGHT
32. FURNISH AND INSTALL TWO SIDEWALL RETURN GRILLE AT 10' 6" AFF TO BOTTOM OF LOWEST GRILLE. THE TWO SIDEWALL RETURN GRILLE WILL BE STACKED VERTICALLY ON TOP OF EACH OTHER.SEE SECTION ON SHEET M-1-300 FOR MORE INFORMATION.

1 / M-1-102 **MECHANICAL PLAN**
SCALE: 1/8" = 1'-0"



REVISION NUMBER	REVISIONS	DATE	BY

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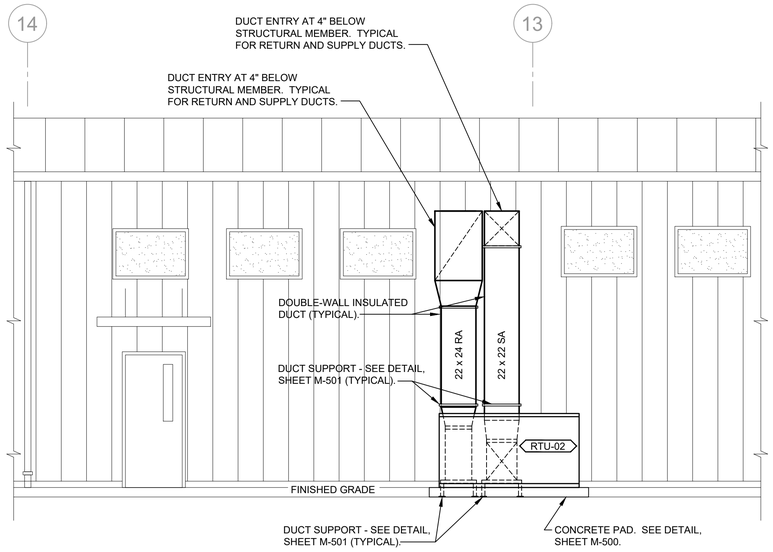
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREA "C"
MECHANICAL PLAN

CORY SHARRARD REGISTERED 26776 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
6/6/2021

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	BM
DESIGNED BY:	CVS/BM
CHECKED BY:	CVS
SHEET NO.	REVISION
M-1-102	



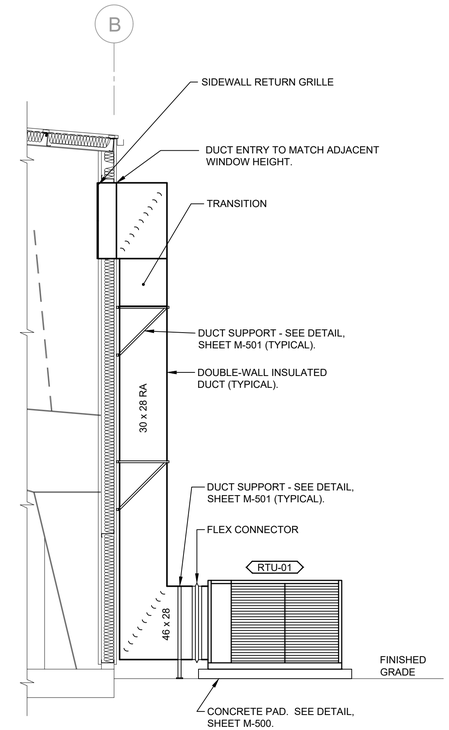
3 M-1-300

MECHANICAL SECTION

SCALE: 1/4" = 1'-0"

0' 4' 8' 12'

SCALE: 1" = 4'



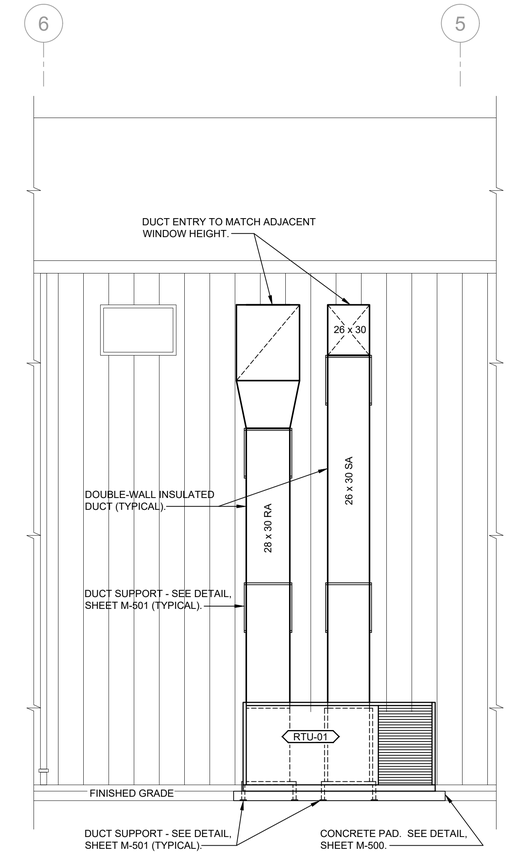
2 M-1-300

MECHANICAL SECTION

SCALE: 1/4" = 1'-0"

0' 4' 8' 12'

SCALE: 1" = 4'



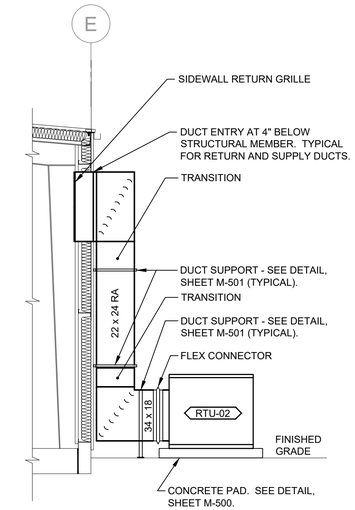
1 M-1-300

MECHANICAL SECTION

SCALE: 1/4" = 1'-0"

0' 4' 8' 12'

SCALE: 1" = 4'



4 M-1-300

MECHANICAL SECTION

SCALE: 1/4" = 1'-0"

0' 4' 8' 12'

SCALE: 1" = 4'

REVISION NUMBER	REVISIONS	DATE	BY

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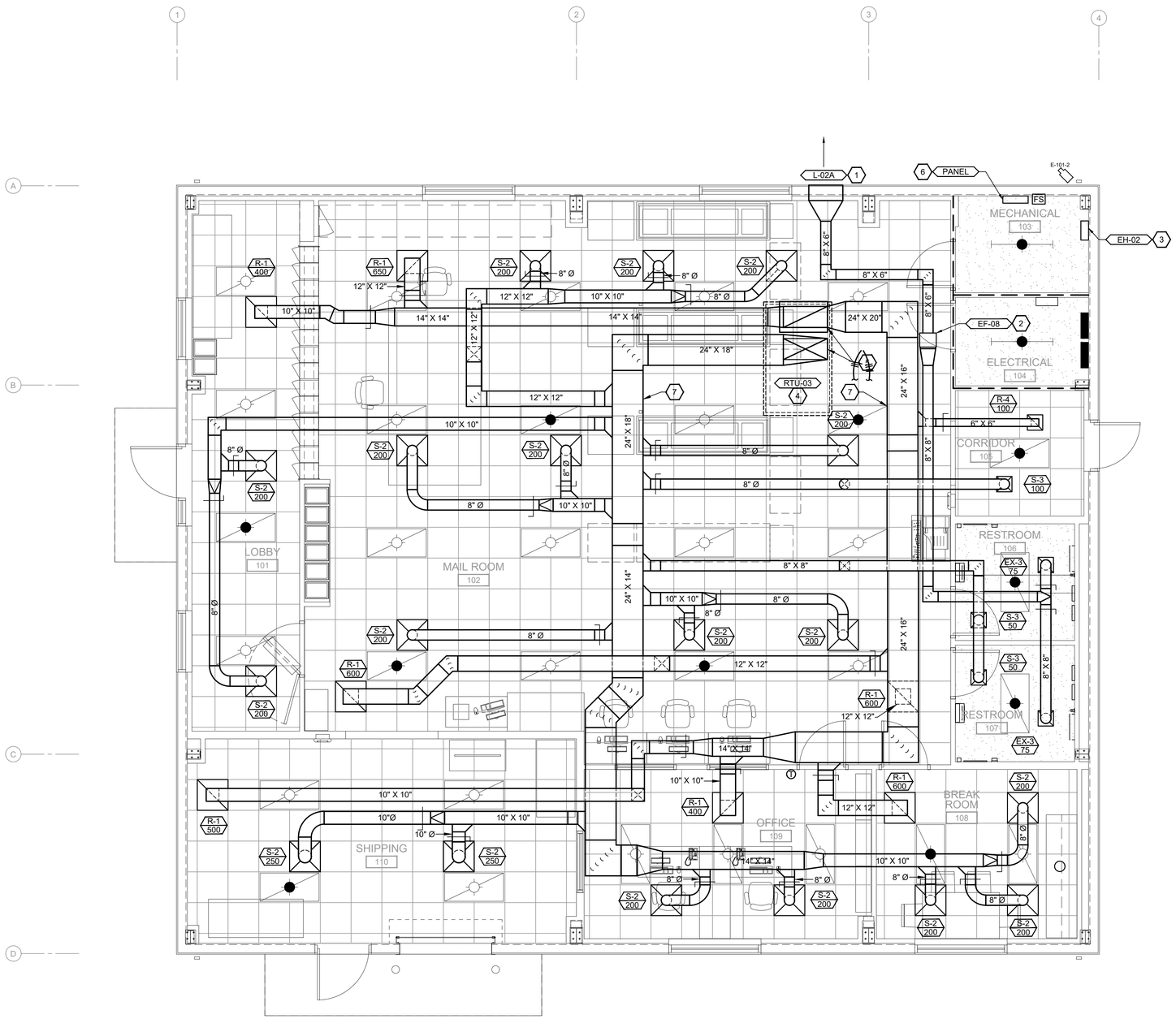
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE - AREA "C"
MECHANICAL SECTIONS

CORY SHARRARD REGISTERED 28725 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
6/30/21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	BM
DESIGNED BY:	CVS/BM
CHECKED BY:	CVS
SHEET NO.	M-1-300
REVISION	



SHEET KEYNOTES:

1. FURNISH AND INSTALL WALL MOUNTED LOUVER. BASE OF WALL MOUNTED LOUVER WITH BACK-DRAFT DAMPER TO BE MOUNTED 10'-0" FROM FINISHED FLOOR LEVEL. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. REFER TO ARCHITECTURAL ELEVATIONS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
2. FURNISH AND INSTALL INLINE EXHAUST FAN ABOVE CEILING, HANG FROM STRUCTURE. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
3. FURNISH AND INSTALL ELECTRIC UNIT HEATER .BASE OF UNIT HEATER TO BE MOUNTED 8'- 0" FROM FLOOR. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS
4. FURNISH AND INSTALL GAS-FIRED ROOF TOP UNIT. PROVIDE WITH ROOF CURB TO FIT ROOF SLOPE. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION. INSTALL PER MANUFACTURERS RECOMMENDATIONS.FOR GAS AND CONDENSATE PIPING INFROMATION REFER TO SHEET P-3-101 AND P-3-102 RESPECTIVELY
5. DUCT PENETRATES THROUGH THE ROOF FROM THE RTU MOUNTED ON ROOF CURB. DUCT TRANSITION DOWN AND ACROSS AS SHOWN.
6. FURNISH AND INSTALL HVAC CONTROL PANEL. INSTALL PER MANUFACTURERS RECOMMENDATION.
7. INSTALL AND COORDINATE DUCTWORK TO AVOID CLASHES WHEN DUCTWORK PASSES UNDER OR OVER EACH OTHER. TYPICAL FOR ALL DUCT.

1 M-3-101 **MECHANICAL PLAN**

SCALE: 1/4" = 1'-0"

0' 2' 4' 8' 12'

SCALE: 1" = 4'

REVISION NUMBER	REVISIONS	DATE	BY

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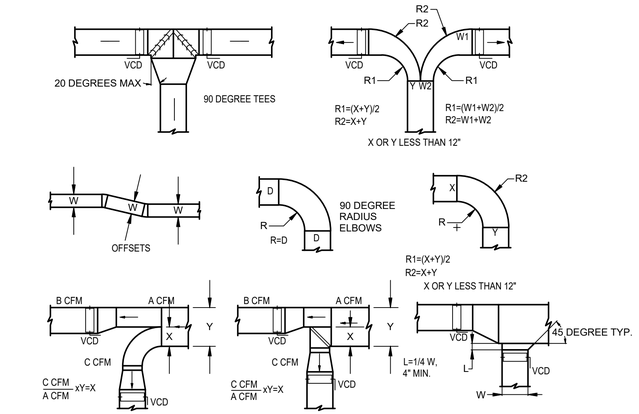
PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1

MECHANICAL PLAN

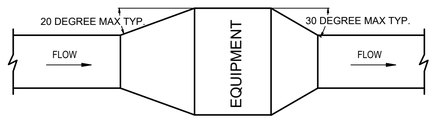
CORY SHARRARD REGISTERED STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 26725
8/6/21

JOB NUMBER:	19027
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CHECKED BY:	CVS
SHEET NO.	M-3-101
REVISION	



1 RECTANGULAR DUCTWORK DETAILS

NOT TO SCALE



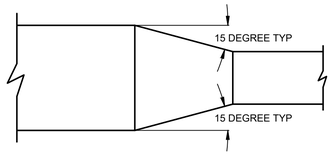
PLAN OR SIDE VIEW

NOTES:

UNLESS OTHERWISE INDICATED ON PLANS, MAXIMUM ANGLES SHOWN SHALL APPLY.

2 DUCT TRANSITION WITH EQUIPMENT IN DUCT DETAIL

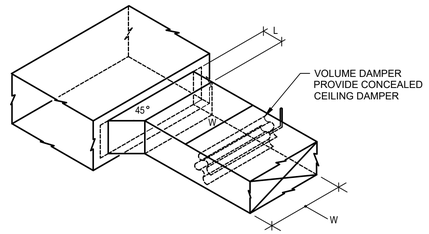
NOT TO SCALE



PLAN OR SIDE VIEW

4 DUCT TRANSITION DETAIL

NOT TO SCALE

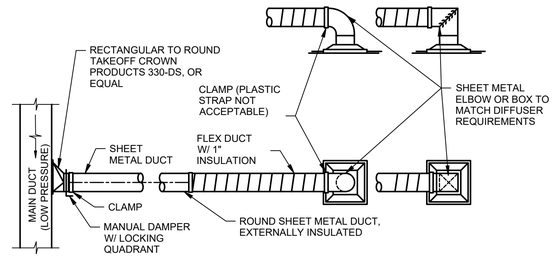


NOTES:

1. DAMPERS SHOULD NOT BE INSTALLED CLOSER THAN TWO DUCT WIDTHS TO ELBOW OR INTERSECTIONS.
2. L = 1/4W (4" MIN.)

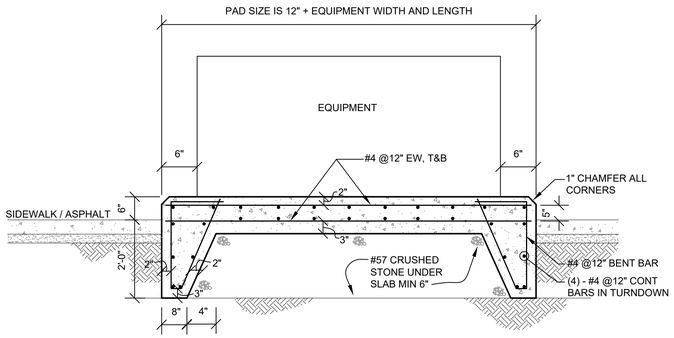
3 BRANCH DUCT TAKE-OFF DETAIL

NOT TO SCALE



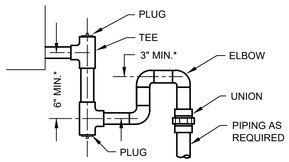
5 TYICAL DIFFUSER & BRANCH DUCT TAKE-OFF DETAIL

NOT TO SCALE



6 PAD MOUNTED RTU CONCRETE PAD DETAIL

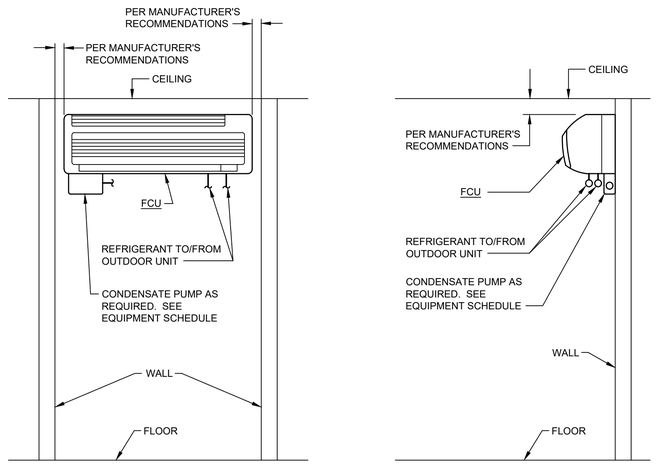
NOT TO SCALE



* PER MANUFACTURER'S REQUIREMENTS

7 HVAC UNIT DRAIN TRAP DETAIL

NOT TO SCALE



ELEVATION ELEVATION

8 DX MINI-SPLIT INDOOR UNIT TRANSITION DETAIL

NOT TO SCALE

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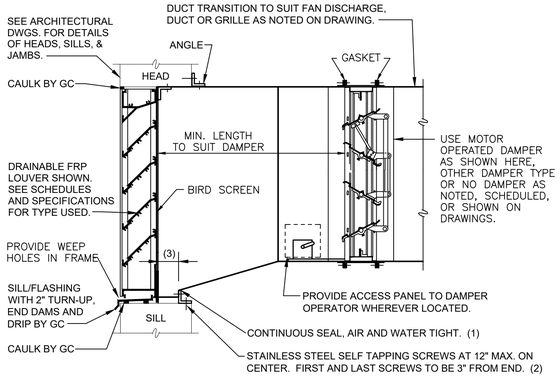
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CORY SHARRARD REGISTERED 28705 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

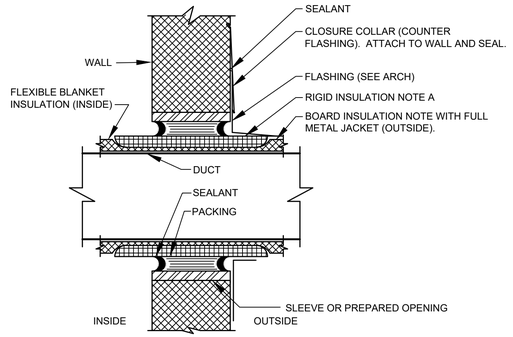
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NOTES:
1. PLENUM CONNECTION TO LOUVER IS SIMILAR.
2. BOTTOM OF DUCT TO BE COMPLETELY OVERLAPPED WITH TURN-UP. DRILL TURN-UP PRIOR TO INSTALLING SELF TAPPING SCREW TO ENSIRE DUCT IS DRAWN TIGHT TO TURN-UP.
3. MINIMUM 1" SCREW CONNECTION CLEARANCE.

1 LOUVER AND DAMPER DETAIL

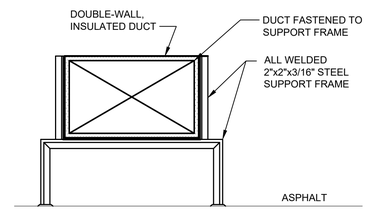
NOT TO SCALE



NOTES:
A. RIGID INSULATION SHALL BE SAME THICKNESS AS FLEXIBLE BLANKET INSULATION.

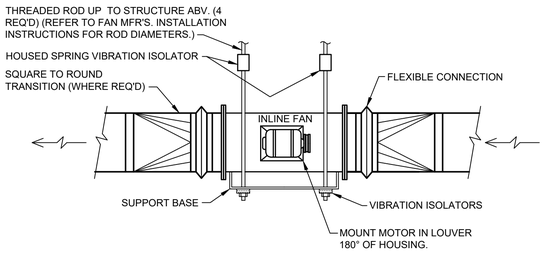
2 TYPICAL DUCT PENETRATION THROUGH EXTERIOR WALL

NOT TO SCALE



3 EXTERIOR DUCT SUPPORT DETAIL

NOT TO SCALE



4 INLINE RETURN OR EXHAUST FAN DETAIL

NOT TO SCALE

FIGURE A - SUGGESTED SIZING

DUCT SIZE	BAND
18"x12"	1 1/2"x16 GA
24"x20"	1"x1/8"

FIGURE B - SUGGESTED SIZING

DUCT SIZE	ANGLE
30"x12"	1"x1"x1/8"
36"x18"	1"x1"x1/8"
42"x24"	1 1/4"x1 1/4"x1/8"
42"x30"	1 1/4"x1 1/4"x1/8"

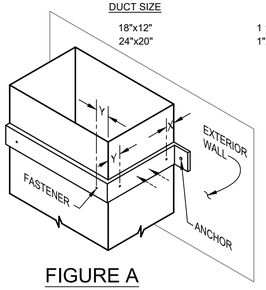


FIGURE A

FASTENER TABLE

DUCT GAGE	ALLOWABLE LOAD PER FASTENER*
28, 26	25 LB
24, 22, 20	35 LB
18, 16	50 LB

* WELD, BOLT OR NO 8 SCREW (MIN.) DEVIATION PERMITTED BY OTHER ANALYSIS. X=1", Y=2"; ADD OTHERS TO ACCOMMODATE LOAD. MINIMUM OF 3 ON 24" WIDTH AND UP. ADD ALONG SIDES NEAREST ANCHLORS.

◄------- SHOWS SUPPLEMENTAL FASTENER LOCATIONS

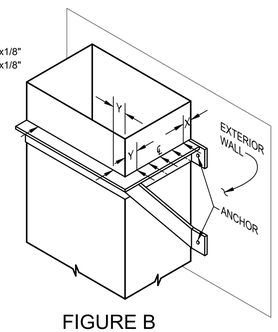
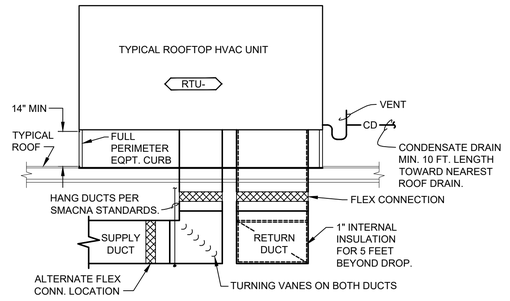


FIGURE B

NOTES:
1. BRACKETS ARE SIZED FOR 12 FEET OF DUCT, MAXIMUM.
2. LOCATE DUCTS AGAINST WALL OR MAXIMUM OF 2" AWAY FROM WALL.
3. EACH WALL ANCHOR SHALL SATISFY THE FLOLLOWING CRITERIA UNLESS OTHER ANALYSIS IS MADE:
   A. TENSILE LOAD = 3/8 x DUCT WEIGHT; SAFETY FACTOR 4.
   B. SHEAR LOAD x 1/2 x DUCT WEIGHT; SAFETY FACTOR 4.

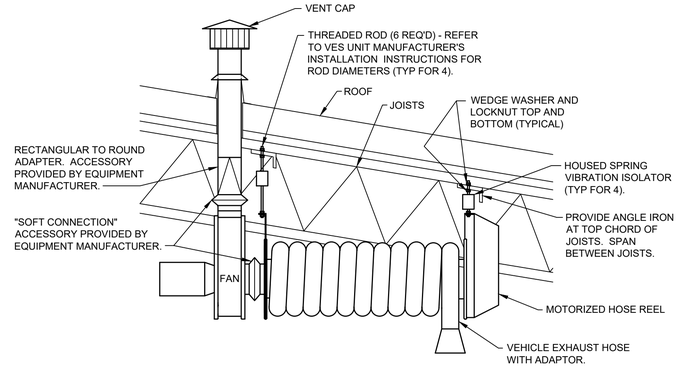
5 DUCT SUPPORT FROM WALL DETAIL

NOT TO SCALE



6 TYPICAL ROOFTOP UNIT DETAIL

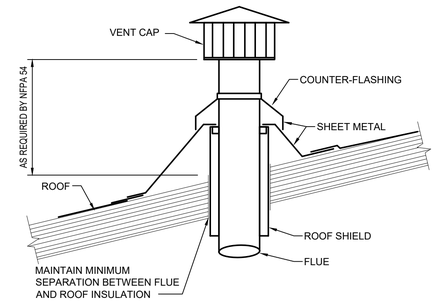
NOT TO SCALE



NOTE:
1. INSTALL VES ASSEMBLIES AS TIGHT TO BOTTOM OF JOISTS TOP CHORD AS POSSIBLE WITHIN MANUFACTURER'S REQUIREMENTS.
2. INSTALL VES ASSEMBLIES IN ACCORDANCE WITH RADIANT HEATER MANUFACTURER'S REQUIRED CLEARANCES.

7 VES INSTALLATION DETAIL

NOT TO SCALE



8 VES FLUE DETAIL

NOT TO SCALE

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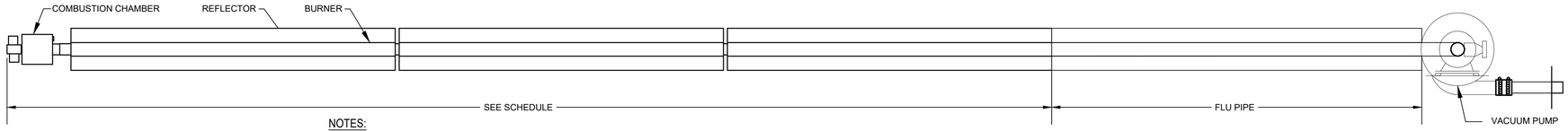
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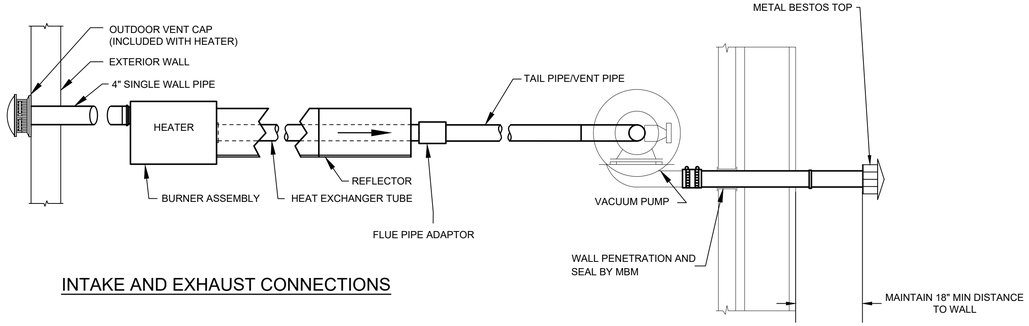
CORY SHARRARD REGISTERED 26726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

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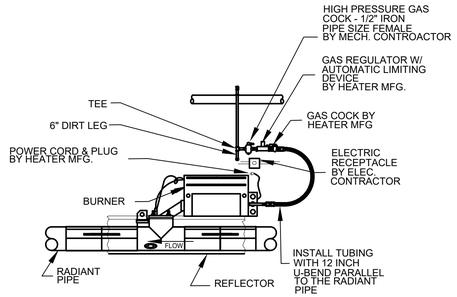


NOTES:
1. PROVIDE AND INSTALL CHAIN HANGERS PER MANUFACTURER'S DIRECTIONS.
2. MAINTAIN CLEARANCES TO COMBUSTIBLES PER MANUFACTURER'S DIRECTIONS.
3. SEE SCHEDULE FOR MOUNTING HEIGHTS.

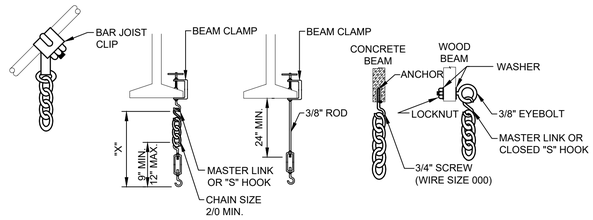
BOTTOM VIEW



INTAKE AND EXHAUST CONNECTIONS



SIDE VIEW

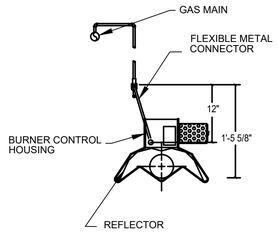


(NOTE: USE ONLY THE TURNBUCKLES FURNISHED BY MANUFACTURER.)

HANGER DETAILS

NOTES:
1. TYPE "B" VENT REQUIRED OUTDOORS.
2. EXHAUST END OF HEATER WILL ACCEPT A 4" VENT PIPE USING THE VENT ADAPTER. INSTALL THE VENT ADAPTER WITH THE SEAM DOWN. THIS WILL PREVENT CONDENSATION FROM LEAKING OUT OF THE ADAPTER.
3. SECURE ALL JOINTS WITH MINIMUM (3) X 3/8 SHEET METAL SCREWS.
4. ALL VENT JOINTS SHOULD BE SEALED USING SUITABLE PRODUCT SUCH AS GENERAL ELECTRIC RTV 106 OR PERMATEX FORM-A-GASKET RD HIGH TEMPERATURE SILICONE ADHESIVE SEALANT.

INTAKE AND EXHAUST CONNECTIONS



END VIEW

NOTES:
1. GAS PIPE WORK MUST BE INSTALLED AND TESTED IN ACCORDANCE WITH THE 2015 EDITION OF NFPA 54. INSTALL THE FLEX GAS CONNECTOR AS SHOWN. THE FLEX GAS CONNECTOR ACCOMMODATES EXPANSION OF THE HEATING SYSTEM AND ALLOWS FOR EASY INSTALLATION AND SERVICE OF THE BURNER.
3. GAS SUPPLY NIPPLE MUST BE PARALLEL TO BURNER INLET. THE 3" DISPLACEMENT SHOWN IS FOR THE COLD CONDITION. THIS DISPLACEMENT MAY REDUCE WHEN THE SYSTEM IS FIRED.

GAS CONNECTION

1 RADIANT HEATER DETAILS

NOT TO SCALE

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PACKAGED ROOF TOP UNIT SCHEDULE

UNIT								COOLING							GAS HEATING				ELECTRICAL			
					SUPPLY FAN			LAT				COMPRESSOR										
MARK	MANUFACTURER	MODEL	WEIGHT	EER / SEER	AIRFLOW (CFM)	TSP (inHPO)	MOTOR SIZE (HP)	LDB (F)	LWB(F)	TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	STAGES	QTY	REFRIGERANT	TYPE	SIZE	TOTAL CAPACITY (MBH)	EDB/LDB	V/Ø/Hz	MCA	MOCP	REMARKS
RTU-01	TRANE	YSH210G	2500	11.0/12.2	7700	1.02	7.5	57.76	57.76	213.11	184.97	-	2	R410	GAS	2STAGE	280	70.00/103.5	460/60/3	44	50	1-3,5-13,16
RTU-02	TRANE	YSC102H	1270	11.2/12.7	4060	1.178	3	58.5	58.1	111.87	94.24	-	2	R410	GAS	1STAGE	96	70.0/92.5	460/60/3	23	25	1-3,5-16
RTU-03	TRANE	RN-007	1270	11.2/12.7	3750	0.901	2	57.7	57.46	111.14	90.32	-	2	R410	GAS	1STAGE	97.2	70.0/94.3	208-230/60/3	44	50	1-13,16

REMARKS:
1. COOLING DESIGN CONDITIONS: EAT 80F DB / 67F WB AND 95F DB / 73F WB AMBIENT. HEATING AMBIENT DESIGN CONDITIONS BASED ON 6F DB / 4F WB.
2. AIR SOURCE DX UNIT WITH GAS HEAT
3. PROVIDE UNIT WITH 2", MERV 8 FILTERS
4. PROVIDE ROOF CURB TO MOUNT UNIT TO ROOFTOP
5. SINGLE POINT POWER CONNECTION WITH FACTORY INSTALLED DISCONNECT SWITCH AND 115V GFI CONVENIENCE OUTLET.
6. PROVIDE WITH SMOKE DETECTOR SHUT DOWN.
7. FAN CYCLING CONTROL OPTION
8. HIGH AND LOW PRESSURE SWITCH.
9. COMPRESSOR SHORT CYCLE TIMER.
10. PROVIDE WITH HAIL GUARD.
11. FACTORY MOUNTED DDC CONTROLLERS WITH BACNET INTERFACE.
12. SEE SPECIFICATIONS FOR MORE INFORMATION
13. PROVIDE WITH PHASE PROTECTION.
14. PROVIDE PREFILTER
15. UNIT TO BE SCHEDULED FOR OCCUPANCY (ADJUSTABLE). THE UNIT WILL BE MONITORED AND CONTROLLED BY THE BMS
16. TO BE MOUNTED ON 6" HOUSEKEEPING PAD

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: DAIKIN, YORK. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

AIR DEVICE SCHEDULE

MARK	MANUFACTURER	MODEL	MAX CFM	MODULE	AIR PATTERN	NECK	MAX NC	REMARKS
S-1	PRICE	AND CONCENTRIC RING NOZZLE	450	12"	15' THROW	12"	15	3,4,5,9
S-2	PRICE	SCD SQUARE CONE DIFFUSER	220	24"x 24"	4' THROW	8"	19	1,3,5,7,9
S-3	PRICE	SCD SQUARE CONE DIFFUSER	100	12" X 12"	4' THROW	8"	19	2,3,5,7,9
R-1	PRICE	EGG CRATE RETURN GRILLE	650	24"X 24"	-	12"X12"	20	1,3,5,7,8,9
R-2	PRICE	510Z SIDEWALL LOUVERED GRILLE	7700	40" X 24"	-		24	3,4,5,9
R-2A	PRICE	510Z SIDEWALL LOUVERED GRILLE	4100	30" X 22"	-		32	3,4,5,9
R-3	PRICE	RSG DUCT MOUNTED LOUVERED CORE GRILLE	600	12"	-	12"	19	3,4,5,9
R-4	PRICE	EGG CRATE RETURN GRILLE	100	12" X 12"	-	6"X6"	20	1,3,5,7,8,9
T-1	PRICE	EGG CRATE RETURN GRILLE	225	24"x 24"	-	-	20	1,3,5,7,8,9
T-2	PRICE	LOUVERED GRILLE	225	10" x 10"	-	-	20	3,5,6,9
EX-1	PRICE	ANFCONCENTRIC RING NOZZLE DIFFUSER	700	12"	-	12"	17	3,4,5,9
EX-2	PRICE	EGG CRATE GRILLE	150	12" X 12"	-		15	1,3,5,9
EX-3	PRICE	EGG CRATE GRILLE	150	12" X 12"	-		15	2,3,5,9
EX-4	PRICE	ANFCONCENTRIC RING NOZZLE DIFFUSER	1300	16"	-	16"	19	3,4,5,9
EX-5	PRICE	EGG CRATE GRILLE	150	12" X 4"	-		19	4,5,9

REMARKS:
1. LAY-IN CEILING TYPE
2. SURFACE MOUNTED
3. COORDINATE AIR DEVICE LOCATIONS WITH REFLECTED CEILING PLANS PRIOR TO INSTALLATION. LIGHTING HAS PRIORITY OVER HVAC
4. DUCT MOUNTED
5. PROVIDE DUCT ADAPTER AND TRANSITION AS REQUIRED
6. SIDEWALL MOUNTED
7. PROVIDE INSULATED PLENUM
8. PROVIDE WITH 1/2" X 1/2" X1" CUBE CORE
9. COLOR TO BE SELECTED BY ARCHITECT

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: KRUEGER, TITUS. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

LOUVER SCHEDULE

MARK	MANUFACTURER	MODEL	INTAKE / EXHAUST	SIZE			CFM	PRESSURE DROP (IN)	FREE AREA (SQ FT)	VELOCITY (FPM)	REMARKS
				WIDTH	HEIGHT	DEPTH					
L-01	GREENHECK	ESD-635	AS SHOWN ON PLAN	26	30	6	1340	0.04	2.6	530	1,2,3,4,5,6,8,9,11
L-02	GREENHECK	ESD-635	AS SHOWN ON PLAN	18	14	6	350	0.054	0.6	602	1,2,3,4,5,6,8,9,11
L-02A	GREENHECK	ESD-635	AS SHOWN ON PLAN	18	14	6	200	0.027	0.5	421	1,2,3,4,5,6,8,9,11,12
L-03	GREENHECK	ESD-635	AS SHOWN ON PLAN	24	32	6	1300	0.034	2.7	477	1,2,3,4,5,6,8,9,11
L-04	GREENHECK	EAD-635	AS SHOWN ON PLAN	36	36	6	2200	0.024	4.8	460	1,2,3,4,5,6,7,8,9
L-05	GREENHECK	EAC-401	AS SHOWN ON PLAN	18	14	4	200	0.024	0.4	452	1,2,3,4,5,6,8,9,10

REMARKS:
1. LOUVER COLOR SELECTED BY ARCHITECT
2. COORDINATE ALL LOUVER LOCATIONS WITH ARCHITECT AND ENGINEER PRIOR TO INSTALLATION
3. ALUMINUM CONSTRUCTION
4. DRAINABLE BLADES
5. STORM PROOF LOUVER
6. MAXIMUM NC LEVEL OF 25
7. PROVIDE WITH FACTORY MOUNTED DAMPER ACTUATOR. CONTROLS CONTRACTOR SHALL PROVIDE REQUIRED POWER TO ACTUATOR. LOUVER SHALL BE INTERLOCKED WITH EF-06 OPERATION
8. PROVIDE BIRD SCREEN
9. PROVIDE INSECT SCREEN
10. PROVIDE WITH FACTORY MOUNTED DAMPER ACTUATOR. CONTROLS CONTRACTOR SHALL PROVIDE REQUIRED POWER TO ACTUATOR. LOUVER SHALL BE CONTROLLED BY BMS BASED ON SCHEDULE
11. PROVIDE WITH GRAVITY BACKDRAFT DAMPER
12. PROVIDE AS PART OF ADD. ALTERNATE #1 PRICING

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: RUSKIN, UNITED ENERTECH. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

SPLIT SYSTEM SCHEDULE

MARK	MANUFACTURER	MODEL	CFM	SEER	COOLING CAPACITY MBH	HEATING CAPACITY MBH	HEATING HPSF	ELECTRICAL			REMARKS
								V/Ø/Hz	FLA	MOCP	
OUTDOOR UNIT											
HP-01	TRANE	4TTA4036A4	-	14	36,000	40,000	GAS-N/A	460/3/60	2.5	15	1,2,5,6,7,8
HP-02	TRANE	4TTA4048A4	-	14	48,000	60,000	GAS-N/A	460/3/60	3	15	1,2,5,6,7,8
INDOOR UNIT											
AHU-1	TRANE	S8X2A040M3PSA4TXCA032BS3HC	1390	-	-	-	GAS-N/A	120/1/60	0.92	15	1,2,3,4,7,8
AHU-2	TRANE	S8X2A040M3PSA4TXCA032BS3HC	1310	-	-	-	GAS-N/A	120/1/60	1.42	15	1,2,3,4,7,8

REMARKS:

1. PROVIDE WITH LOW AMBIENT CONTROL TO -40 F, WASHABLE FILTER AND R-410A
2. INSTALL PER MANUFACTURER'S INSTRUCTIONS
3. PROVIDE OUTSIDE AIR DUCT DAMPER TO MODULATE OA INTO SPLIT SYSTEM
4. PROVIDE 1" FILTER
5. PROVIDE EVAPORATOR DEFROST CONTROL
6. OUTDOOR UNIT TO BE MOUNTED ON 6" HOUSEKEEPING PAD ON GRADE
7. UNIT TO BE SCHEDULED FOR OCCUPANCY (ADJUSTABLE). THERMOSTATS WILL BE MONITORED AND CONTROLLED BY THE BMS
8. PROVIDE WITH FACTORY DISCONNECT SWITCH. IF FACTORY DISCONNECT NOT AVAILABLE INSTALL A DISCOONECT SWITCH

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: DAIKIN, YORK. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

MINI SPLIT SYSTEM SCHEDULE

MARK	MANUFACTURER	MODEL	CFM	SEER	NOM. COOLING CAPACITY MBH	NOM. HEATING CAPACITY MBH	HEATING HSPF	ELECTRICAL				REMARKS
								V/Ø/Hz	RFS	MCA	MOCP	
OUTDOOR UNIT												
MSOU-01	MITSUBISHI/TRANE	PUY-A12NKA7-BS	-	20.8	12	0		208/1/60	15	11	15	1,2,3,4,7,8,9
INDOOR UNIT												
MSIU-01	MITSUBISHI/TRANE	PKA-A12HA7	320	-	-	-	-	208/1/60	14	1	FLA=0.33	1,2,3,4,5,6,7,9

REMARKS:
1. DESIGN CONDITIONS: 95DB/78WB SUMMER, 0DB WINTER, 75DB/75WB INDOOR.
2. COOLING ONLY UNIT.
3. FURNISH WITH WIRED REMOTE CONTROLLER / THERMOSTAT. UNIT TO BE CONTROLLED BY THERMOSTAT
4. WITH LOW AMBIENT CONTROL TO -40 F, WASHABLE FILTER AND R-410A
5. PROVIDE WITH CONDENSATE PUMP
6. INDOOR UNIT SHALL BE WALL MOUNTED UNIT.
7. INSTALL PER MANUFACTURER'S INSTRUCTIONS
8. OUTDOOR UNIT SHALL BE INSTALLED ON 6" HOUSEKEEPING PAD ON GRADE.
9. PROVIDE WITH FACTORY DISCONNECT SWITCH. IF FACTORY DISCONNECT NOT AVAILABLE INSTALL A DISCOONECT SWITCH

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: DAIKIN, YORK. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

MECHANICAL
MECHANICAL SCHEDULES

CORY SHARRARD REGISTERED 26776 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 6/9/21

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	BM
DESIGNED BY:	BM
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REVISION	△

EXHAUST FAN SCHEDULE

MARK	MANUFACTURER	MODEL	CFM	ESP (IN H20)	SONES	DRIVE TYPE	RPM	ELECTRICAL				REMARKS
								V/Ø/Hz	HP	FLA	MOCP	
EF-01	GREENHECK	SQ-130-B	1346	0.27	7.3	Direct	1140	115/60/1	1/4	5.8	15	1,2,3,5,7
EF-02	GREENHECK	CUE-090-VG	350	0.20	3.8	Direct	1023	115/60/1	1/10	1.5	15	1,2,5,7,11
EF-03	GREENHECK	SQ-90-VG	440	0.40	7.5	Direct	1567	115/60/1	1/6	2.8	15	1,2,3,5,8
EF-04	GREENHECK	SQ-140-C	1305	0.25	6.2	Direct	860	115/60/1	1/8	1	15	1,2,3,5,7
EF-05	GREENHECK	CSP-A190	171	0.30	2.9	Direct	1400	115/60/1	FRAC.	0.5	15	1,2,3,5,7
EF-06	PLYMOVENT	TEV-3110	2200	0.50	28.0	Direct	3460	460/60/3	3	4	15	1,2,4,6,9
EF-07	GREENHECK	SQ-140-C	1261	0.28	6.1	Direct	860	115/60/1	1/8	1	15	1,2,3,5,7
EF-08	GREENHECK	CSP-A390-VG	150	0.30	0.9	Direct	986	115/60/1	1/15	1.5	15	1,2,3,5,7,10

REMARKS:
1. PROVIDE WITH UNIT MOUNTED DISCONNECT
2. PROVIDE WITH UNIT MOUNTED SPEED CONTROL
3. INLINE FAN
4. INTERLOCK WITH WELDING HOOD CONTROL SWITCH AND MOTORIZED LOUVER
5. SUPPORT FROM THE STRUCTURE
6. EXTERIOR GROUND MOUNTED ON 6" HOUSEKEEPING PAD
7. FAN TO BE CONTROLLED AND MONITORED BY ADJUSTABLE SCHEUDLE FOR BUILDING OCCUPANCY BY BMS
8. FAN TO BE MONITORED BY BMS AND RUN CONTINUOSLY
9. FAN TO BE CONTROLLED BY FACTORY CONTROLS. DESIGN BASIS USES A PLYMOVENT MANUAL CONTROL UNIT
10. PROVIDE AS PART OF ADD. ALTERNATE #1 PRICING
11. CENTRIFUGAL WALL MOUNTED FAN

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: CARNES, COOK. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

GAS FIRED RADIANT TUBE HEATER SCHEDULE

MARK	MANUFACTURER	MODEL	LENGTH	GAS INFORMATION		FAN MOTOR ELECTRICAL		FLUE	ELECTRICAL			REMARKS
				INPUT (MBH)	OUTPUT (MBH)	HP	RPM	SIZE	V/Ø/Hz	FLA	MOCP	
IR-01	ROBERTS GORDON	CRV B-9	35'	90	63	1/3	3450	4"	120/1/60	0.5	15	ALL
IR-02	ROBERTS GORDON	CRV-B9	30'	90	63	1/3	3450	4"	120/1/60	0.5	15	ALL
IR-03	ROBERTS GORDON	CRV-B10	35'	100	70	1/3	3450	4"	120/1/60	0.5	15	ALL
IR-04	ROBERTS GORDON	CRV-B10	40'	100	70	1/3	3450	4"	120/1/60	0.5	15	ALL

REMARKS:
1. INSTALL AS HIGH AS POSSIBLE TO AVOID WORKING AREA BELOW, REFER TO SHEET NOTES AND DETAILS FOR MORE INFORMATION
2. COORDINATE OUTSIDE AIR DUCT WITH END VENT PER MANUFACUTRER RECOMMENDATION
3. COORDINATE FLUE PENETRATIONS WITH END CAP PER MANUFACUTRER RECOMMENDATION
4. GAS FIRED INFRARED HEATERS TO BE CONTROLLED BY FACTORY PROVIDED THERMOSTATS. CURRENT OPERATING STATUS TO BE COMMUNICATED WITH THE BMS
5. REFER TO ELECTRICAL SHEETS FOR INFORMATION ON DISCONNECT FOR VACUUM PUMP
6. BASIS OF DESIGN IR SYSTEMS ALSO CONSISTS OF 1/3 HP VACUUM PUMP (115/230V, 1 PHASE) AND PORCELAIN COATED FLUE GAS TAIL PIPE TO BE SUPPLIED BY MANUFACTURER.
7. COORDINATE TAILPIPE LENGTH WITH LOCATION OF PUMP AND VENT

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: REZNOR, MODINE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

WELDING HOOD SCHEDULE

MARK	MANUFACTURER	MODEL	MOUNTING	CFM	SIZE			REMARKS
					WIDTH (FT)	LENGTH (FT)	HEIGHT (FT)	
WH-01	PLYMOVENT	FLEXHOOD	CEILING	2200	8.2	11.5	10	ALL

REMARKS:

1. PROVIDE WITH CEILING MOUNTING. CONTRACTORS TO PROVIDE CHAIN LINKS (MIN 8MM)
2. PROVIDE WITH KNEE HIGH, ORANGE RED SEMI TRANSPARENT CURTAIN STRIPS AROUND PERIMETER FROM MANUFACTURER
3. LOWEST POINT OF WELDING HOOD TO BE MOUNTED 10'-0" ABOVE FINISHED FLOOR LEVEL
4. WELDING HOOD TO BE CONTROLLED BY ACTIVATION OF WELDING EXHAUST FAN AND LOUVERS BY THE FACTORY CONTROLS

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: INDUSTRIAL MAID, LINCOLN ELECTRIC. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

ELECTRIC HEATER SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	CFM	BTUH	ELECTRICAL				REMARKS
						V/Ø/Hz	KW	MCA	MOCP	
EH-01	TRANE	UHEC-031C0C0	WALL MOUNTED	400	11,200	277/1/60	3.3	11.9A	15A	1,2, 3
EH-02	TRANE	UHEC-031A0C0	WALL MOUNTED	400	11,200	208/1/60	3.3	15.9A	20A	1,2, 3

REMARKS:
1. INTEGRAL THERMOSTAT AND DISCONNECT
2. PROVIDE REQUIRED MOUNTING BRACKET FOR MOUNTING AS INDICATED
3. MOUNT HEATER AS HIGH AS POSSIBLE UNLESS NOTED OTHERWISE IN SHEET

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: Q-MARK, REDDI. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

VEHICLE EXHAUST SYSTEM SCHEDULE

MARK	MANUFACTURER	MODEL	MOUNTING	CFM	ESP (IN WC)	HP	RPM	ELEC.	REMARKS
VES-01	PLYMOVENT	MSHR-850-115/FUA-2100	CEILING	700	3.5	1	3450	460V/3P/60Hz	ALL

REMARKS:

1. PROVIDE WITH MOTORIZED SPRING ASSISTED HOSE REEL.
2. PROVIDE WITH "SOFT CONNECTION" ON FAN INLET AND OUTLET.
3. PROVIDE WITH QUICK CONNECT HOSE CONNECTION ADAPTORS.
4. PROVIDE WITH FAN CONTROL PANEL WITH REMOTE FAN START/STOP SWITCH AND INTEGRAL UP/DOWN CONTROLS.
5. PROVIDE WITH 6" DIA., 25' LONG, HIGH TEMPERATURE RESISTANT, EXHAUST HOSE.
6. THE POWER FOR THIS SYSTEM WILL NOT BE AVAILABLE UNTIL THE FINAL PHASE FOR FINAL INSTALLATION. IT CAN BE INSTALLED DURING PHASE 1, BUT NOT ELECTRICALLY CONNECTED UNTIL THE FINAL PHASE.

OTHER ACCEPTABLE MANUFACTURERS INCLUDE: INDUSTRIAL MAID, LINCOLN ELECTRIC. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

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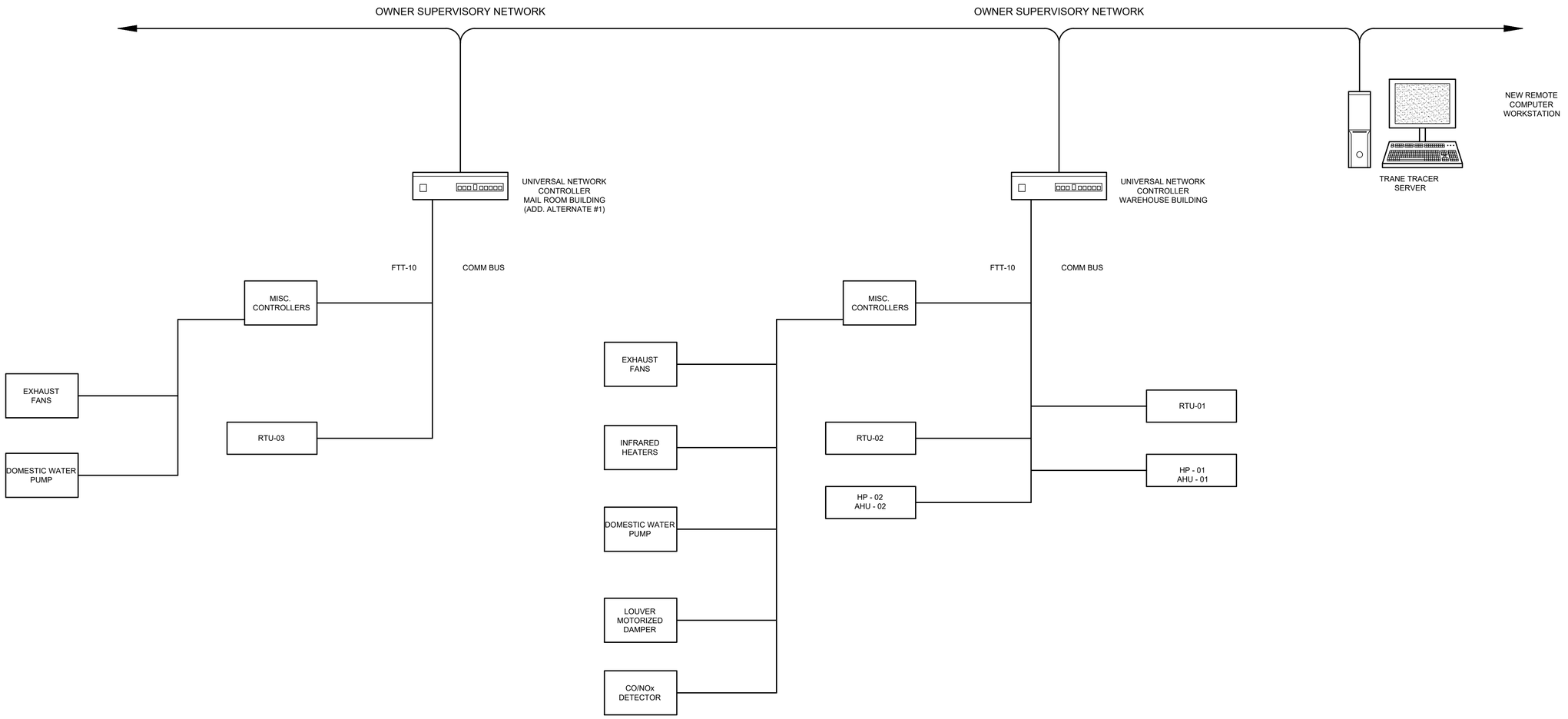
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West Virginia Department of Administration
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MECHANICAL
MECHANICAL SCHEDULES

CORY SHARRARD REGISTERED 26725 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
8/6/21

JOB NUMBER:	19027
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DATE:	AUGUST 6, 2021
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1 DDC NETWORK COMMUNICATIONS DIAGRAM

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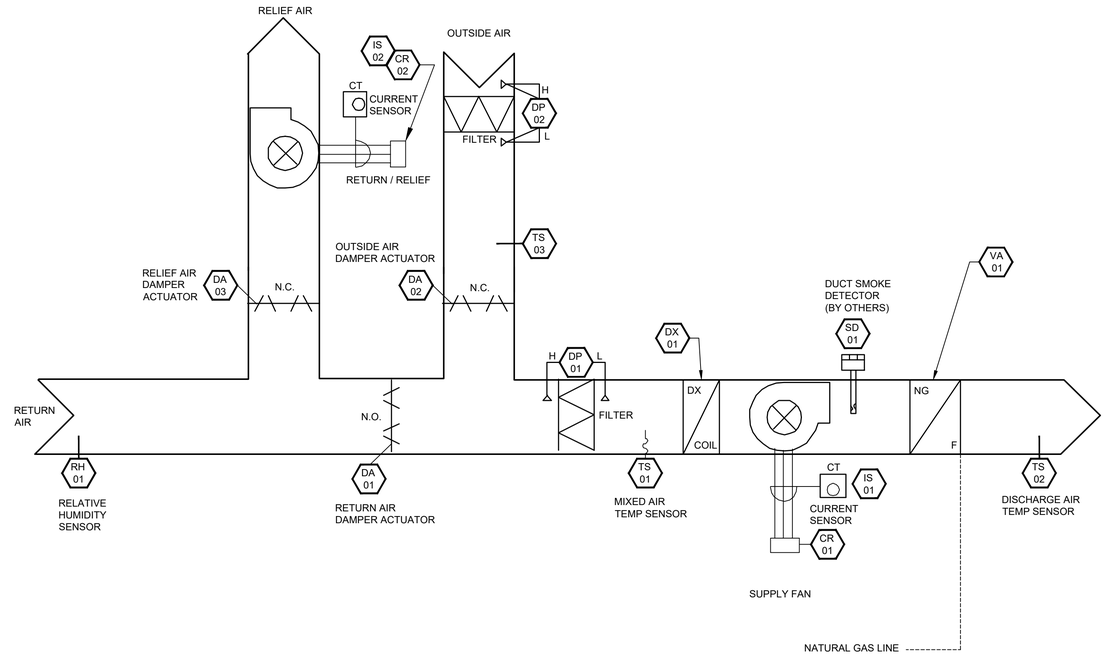
MECHANICAL
MECHANICAL CONTROLS

CORY SHARRARD REGISTERED 28725 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
8/6/21

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SHEET NO.	REVISION
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OPERATING PARAMETERS

FUNCTION	SET POINT (ADJUSTABLE)	REMARKS
SPACE TEMPERATURE SETPOINT - COOLING	75 F (24 C)	DEAD BAND +/- 2.5 F (1.5 C)
SPACE TEMPERATURE SETPOINT - HEATING	68 F (20 C)	DEAD BAND +/- 2.5 F (1.5 C)
SPACE RELATIVE HUMIDITY SETPOINT - COOLING	50% RH	DEAD BAND +/- 5% RH
SPACE RELATICE HUMIDITY SETPOINT - HEATING	50% RH	DEAD BAND +/- 10% RH
ECONOMIZER COOLING SWITCHOVER TEMP	55 F (13 C)	OAT = or < SETPOINT
MIXED AIR TEMPERATURE	55 F (13 C)	
NIGHT SET UP TEMP SETPOINT - COOLING	80 F (27 C)	DEAD BAND +/- 2 F (2 C)
NIGHT SET BACK TEMP SETPOINT - HEATING	60 F (16 C)	DEAD BAND +/- 2 F (2 C)



1 RTU-01,02,03 CONTROL DIAGRAM

NOT TO SCALE

HARDWARE																				SOFTWARE						
			OUTPUT								INPUT									ALARMS						
			DIGITAL				ANALOG				DIGITAL				ANALOG					DIGITAL		ANALOG				
TAG	POINT DESCRIPTION	UNITS	START/STOP	ENABLE/DISABLE	YES/NO	OPEN/CLOSE	CONTROL PNT ADJ	POSITION ADJ	0-10 VDC SPEED	4-20 MA	STATUS	ALARM CONTACTS	CURRENT SENSOR	PRESS SWITCH	REL HUMIDITY	DUCT TEMP	PRESSURE	SPEED 4-20 MA		ALARM STATUS		HIGH LIMIT ADJ	LOW LIMIT ADJ		SETPOINT ADJ	
	ROOF TOP UNIT CONTROLS with RELIEF FAN AND ECONOMIZER OPTION																									
TS-01	DX COIL DISCHARGE **OR** MIXED AIR TEMPERATURE	DEG **F** (DEG **C**)														X						60	45		55	
TS-02	SUPPLY AIR TEMPERATURE	DEG **F** (DEG **C**)														X						105	45		55	
TS-03	OUTSIDE AIR TEMPERATURE	DEG **F** (DEG **C**)														X										
RH-01	RETURN AIR RELATIVE HUMIDITY	%RH													X							60	40		50	
DP-01	FILTER STATUS - RETURN AIR	IN WG (PA)															X									
DP-02	FILTER STATUS - OUTSIDE AIR	IN WG (PA)															X									
IS-01	SUPPLY FAN STATUS	ON/OFF											X													
IS-02	RELIEF FAN STATUS	ON/OFF											X													
SD-01	SMOKE DETECTOR	ON/OFF									X															
VA-01	NATURAL GAS VALVE COMMAND	PER (%)						X																		
DA-01	RETURN AIR DAMPER	PER (%)						X																		
DA-02	OUTSIDE AIR DAMPER	PER (%)						X																		
DA-03	RELIEF / EXHAUST AIR DAMPER	PER (%)						X																		
CR-01	SUPPLY FAN COMMAND	ON/OFF	X																							
CR-02	RELIEF FAN COMMAND	ON/OFF	X																							

UNITARY PACKAGE AIR CONDITIONING SYSTEM SINGLE ZONE CONSTANT VOLUME SEQUENCE OF OPERATION

1. SUPPLY FAN - SHALL BE ENABLED TO RUN CONTINUOUSLY DURING OCCUPIED MODE. DURING UNOCCUPIED MODE SUPPLY FAN SHALL CYCLE ON/OFF TO MAINTAIN SPACE TEMPERATURE. RELIEF FAN SHALL OPERATE DURING ECONOMIZER MODE.

2. REMOTE EXHAUST FAN(S) - SHALL BE ENABLED TO RUN CONTINUOUSLY DURING OCCUPIED AND ECONOMIZER MODES.

3. DAMPER CONTROL - OUTSIDE AIR DAMPER SHALL OPEN TO MINIMUM OUTSIDE AIR VOLUME PER UNIT SCHEDULE DURING OCCUPIED MODE. OUTSIDE AIR DAMPER SHALL CLOSE IF SUPPLY FAN IS OFF OR IF NIGHT SETBACK OR SET UP IS IN OPERATION.

4. COOLING COIL CONTROL - IN COOLING MODE DX COIL SHALL MAINTAIN COOLING COIL DISCHARGE TEMPERATURE SETPOINT. DURING COOLING MODE IF SPACE TEMPERATURE DROPS 3 F BELOW SETPOINT FOR MORE THAN 10 MINUTES (ADJUSTABLE) DX COOLING COIL SHALL CYCLE OFF UNTIL SPACE TEMPERATURE RISES TO SETPOINT. IN HEATING MODE DX COIL SHALL BE LOCKED OUT.

5. HEATING CONTROL - DURING HEATING MODE IF SPACE TEMPERATURE DROPS 5 F BELOW SETPOINT FOR MORE THAN 15 MINUTES (ADJUSTABLE) NATURAL GAS FURNACE SHALL OPERATE UNTIL SPACE TEMPERATURE MEETS SETPOINT. NATURAL GAS FURNACE SHALL MODULATE TO MAINTAIN THE HEATING SPACE TEMPERATURE SETPOINT. DURING COOLING HEATING SHALL BE OFF.

6. ECONOMIZER - ENABLE ECONOMIZER COOLING WHEN OUTSIDE AIR TEMPERATURE IS EQUAL TO OR LESS THAN THE ECONOMIZER COOLING SWITCHOVER SETPOINT (55 F ADJ). DX COOLING COIL SHALL SEQUENCE OFF. RETURN AIR DAMPER SHALL CLOSE AND OUTSIDE AIR AND EXHAUST (RELIEF) AIR DAMPERS SHALL OPEN TO MAINTAIN MIXED AIR TEMPERATURE SETPOINT. IF RETURN AIR RELATIVE HUMIDTY SETPOINT IS EXCEEDED THE DX COOLING COIL SHALL BE SEQUENCED ON UNTIL RETURN AIR RELATIVE HUMIDITY SETPOINT IS MET. WHEN THE OUTSIDE AIR TEMPERATURE IS GREATER THAN THE SWITCHOVER SETPOINT ECONOMIZER COOLING IS DISABLED.

7. SMOKE / FIRE ALARMS - ACTIVATION OF ROOFTOP UNIT DUCT SMOKE DETECTOR SHALL DE-ENERGIZE ASSOCIATED UPAC UNIT AND SEND AN ALARM SIGNAL TO THE FIRE ALARM SYSTEM. FIRE ALARM SYSTEM SHALL SEND A SUPERVISORY SIGNAL TO THE UPAC CONTROL SYSTEM.

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MECHANICAL
MECHANICAL CONTROLS

CORY SHARMAHD REGISTERED 26795 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/9/21

JOB NUMBER:	19027
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DATE:	AUGUST 6, 2021
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OPERATING PARAMETERS

FUNCTION	SET POINT (ADJUSTABLE)	REMARKS
COOLING COIL DISCHARGE AIR TEMPERATURE SETPOINT	VARIES	SEE AIR HANDLING UNIT SCHEDULE
HEAT COIL DISCHARGE AIR TEMPERATURE SETPOINT	VARIES	SEE AIR HANDLING UNIT SCHEDULE
SPACE TEMPERATURE SETPOINT - COOLING	75 F (24 C)	DEAD BAND +/- 2 F (2 C)
SPACE TEMPERATURE SETPOINT - HEATING	68 F (20 C)	DEAD BAND +/- 2 F (2 C)
SPACE RELATIVE HUMIDITY SETPOINT - COOLING	50% RH	DEAD BAND +/- 5% RH
SPACE RELATICE HUMIDITY SETPOINT - HEATING	50% RH	DEAD BAND +/- 10% RH
MIXED AIR TEMPERATURE	55 F (13 C)	
NIGHT SET UP TEMP SETPOINT - COOLING	80 F (27 C)	DEAD BAND +/- 2 F (2 C)
NIGHT SET BACK TEMP SETPOINT - HEATING	60 F (16 C)	DEAD BAND +/- 2 F (2 C)
FILTER ALARM	0.75" WG (185 Pa)	

DX SPLIT SYSTEM SINGLE ZONE CONSTANT VOLUME SEQUENCE OF OPERATION

1. SUPPLY FAN - SHALL BE ENABLED TO RUN CONTINUOUSLY DURING OCCUPIED MODE. DURING UNOCCUPIED MODE SUPPLY FAN SHALL CYCLE ON/OFF TO MAINTAIN SPACE TEMPERATURE.

2. REMOTE EXHAUST FAN - SHALL BE ENABLED TO RUN CONTINUOUSLY DURING OCCUPIED AND ECONOMIZER MODES.

3. DAMPER CONTROL - OUTSIDE AIR DAMPER SHALL OPEN TO MINIMUM OUTSIDE AIR VOLUME PER AIR HANDLING UNIT SCHEDULE DURING OCCUPIED MODE. OUTSIDE AIR DAMPER SHALL CLOSE IF SUPPLY FAN IS OFF OR IF NIGHT SETBACK OR SET UP IS IN OPERATION.

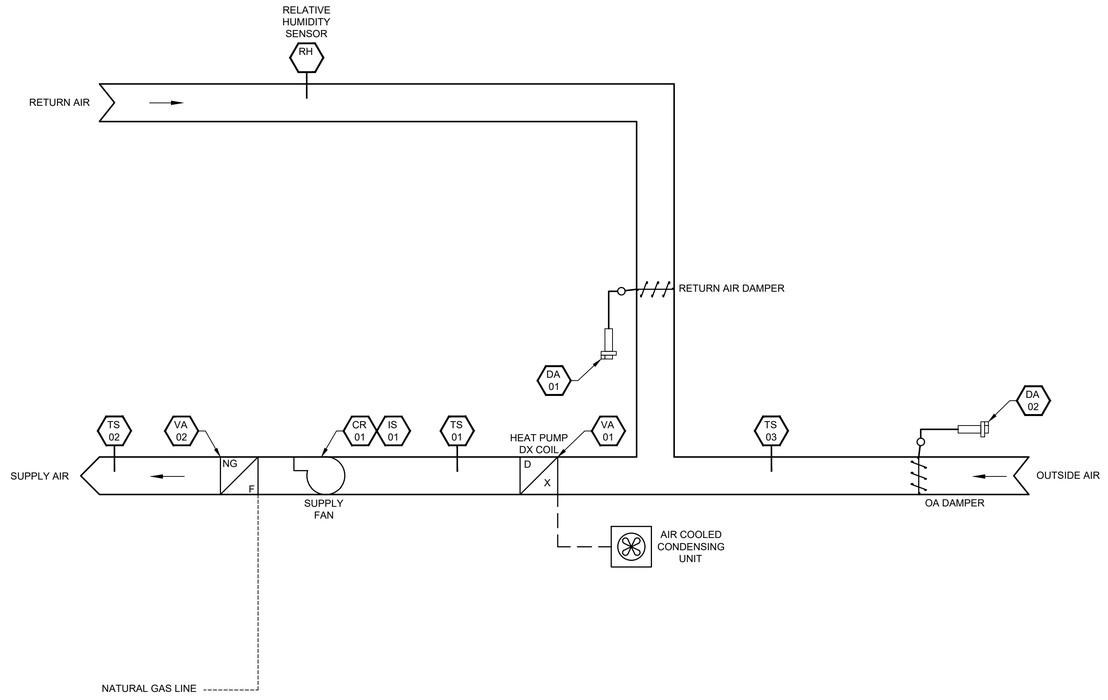
4. COOLING COIL CONTROL - IN COOLING MODE DX COIL SHALL MAINTAIN COOLING COIL DISCHARGE TEMPERATURE SETPOINT. IN HEATING MODE DX COIL SHALL BE LOCKED OUT.

5. HEATING CONTROL - DURING HEATING MODE IF SPACE TEMPERATURE DROPS 5 F BELOW SETPOINT FOR MORE THAN 15 MINUTES (ADJUSTABLE) NATURAL GAS FURNACE SHALL OPERATE UNTIL SPACE TEMPERATURE MEETS SETPOINT. NATURAL GAS FURNACE SHALL MODULATE TO MAINTAIN THE HEATING SPACE TEMPERATURE SETPOINT. DURING COOLING HEATING SHALL BE OFF.

6. UNOCCUPIED MODE (TIMEFRAME USER DEFINED) - DURING UNOCCUPIED MODE CONTROL SYSTEM SHALL MODULATE HEATING OR COOLING COILS TO MAINTAIN SPACE SET UP / BACK TEMPERATURE AS SCHEDULED. OUTSIDE AIR DAMPERS SHALL CLOSE.
UNOCCUPIED MODE CONTINUES UNTIL OPTIMAL START ROUTINE IS INITIATED AND CONTROL SYSTEM RETURNS TO OCCUPIED MODE OF OPERATION.

7. SMOKE / FIRE ALARMS - ACTIVATION OF ROOFTOP UNIT DUCT SMOKE DETECTOR SHALL DE-ENERGIZE ASSOCIATED ROOFTOP UNIT AND SEND AN ALARM SIGNAL TO THE FIRE ALARM SYSTEM. FIRE ALARM SYSTEM SHALL SEND A SUPERVISORY SIGNAL TO THE ROOFTOP UNIT CONTROL SYSTEM.

HARDWARE																								SOFTWARE								
			OUTPUT											INPUT										ALARMS								
			DIGITAL				ANALOG							DIGITAL			ANALOG							DIGITAL			ANALOG					
TAG	POINT DESCRIPTION	UNITS	START/STOP	ENABLE/DISABLE	YES/NO	OPEN/CLOSE	CONTROL PNT ADJ	POSITION ADJ	0-10 VDC SPEED	4-20 MA		STATUS	ALARM CONTACTS	CURRENT SENSOR	PRESS SWITCH	REL HUMIDITY	DUCT TEMP	POSITION	SPEED 4-20 MA			ALARM STATUS		HIGH LIMIT ADJ	LOW LIMIT ADJ			SETPOINT ADJ		
	DX SPLIT SYSTEM w/ EXHAUST FAN AND ECONOMIZER OPTION																														
TS-01	DX COIL DISCHARGE **OR** MIXED AIR TEMPERATURE	DEG **F** (DEG **C**)															X							60	45			55		
TS-02	SUPPLY AIR TEMPERATURE	DEG **F** (DEG **C**)															X							105	45			55		
TS-03	OUTSIDE AIR TEMPERATURE	DEG **F** (DEG **C**)															X													
RH-01	RETURN AIR RELATIVE HUMIDITY	%RH														X								60	40			50		
IS-01	SUPPLY FAN STATUS	ON/OFF												X																
VA-01	DX HEAT PUMP COIL CONTROL	PER (%)						X																						
VA-02	NATURAL GAS VALVE COMMAND	PER (%)						X																						
DA-01	RETURN AIR DAMPER	PER (%)						X																						
DA-02	OUTSIDE AIR DAMPER	PER (%)						X																						
CR-01	SUPPLY FAN COMMAND	ON/OFF	X																											



1 SINGLE ZONE CONSTANT VOLUME DX SPLIT SYSTEM WITH GAS HEAT (AHU-1,AHU-2,HP-01,HP-02) CONTROLS DIAGRAM

NOT TO SCALE

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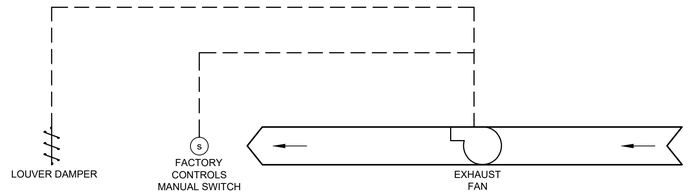
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
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Charleston, West Virginia

MECHANICAL
MECHANICAL CONTROLS

CORY SHARRARD REGISTERED 28726 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 6/30/21

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SHEET NO.	REVISION
M-702	



1 WELDING HOOD EXHAUST FAN DIAGRAM (EF-06)

NOT TO SCALE

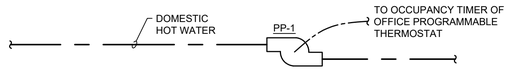
SEQUENCE OF OPERATION - WELDING EXHAUST FAN

WELDING EXAUST FAN CONTROL:

ON/OFF SWITCH TO CONTROL WELDING EXHAUST FAN

CONTROLS TO BE FACTORY PROVIDED

CONTROLS SHOULD BE CAPABLE OF INTERLOCKING EXHAUST FAN OPERATION WITH LOUVER



SEQUENCE OF OPERATION - DOMESTIC HOT WATER RECIRCULATION PUMP

DOMESTIC HOT WATER RECIRCULATION PUMP CONTROL:

DURING UNOCCUPIED TIMES (WEEKENDS AND OFF HOURS) THE PUMP SHALL BE DISABLED.

BMS TO RECIEVE PUMP STATUS (ON/OFF)

SEQUENCE OF OPERATION - EXHAUST FAN

EXAUST FAN CONTROL:

EXHAUST FAN SHALL BE ENABLED CONTINUOUSLY UNDER HAND-OFF-AUTOMATIC (H-O-A) CONTROL. DURING AUTOMATIC (A) FANS CONTROLLED BY BMS SCHEDULE.

CURRENT SENSOR DRY CONTACTS FOR EXHAUST FAN STATUS TO BUILDING MANAGEMENT SYSTEM.

SEQUENCE OF OPERATION - INFRARED HEATER

INFRARED HEATER CONTROL:

THERMOSTAT WILL CYCLE THE INFRARED HEATER SYSTEM TO MAINTAIN THE DESIRED SETPOINT (ADJUSTABLE)..

CURRENT SENSOR DRY CONTACTS FOR INFRARED HEATER STATUS (ON/OFF) AND TEMPERATURE OF SPACE TO BUILDING MANAGEMENT SYSTEM.

SEQUENCE OF OPERATION - CO/NOx DETECTOR

CO/NOx CONTROL:

CO AND NOx SENSOR SHALL CONTINUOUSLY MONITOR PPM OF GAS IN ROOM.

ONCE SETPOINT IS REACHED SENSOR SHOULD TRIGGER AUDIBLE AND VISUAL ALARM.

SENSOR SHALL ALSO REPORT WARNING TO BMS.

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
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(304) 727-5501
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

MECHANICAL
MECHANICAL CONTROLS

CORY SHARRARD REGISTERED 26725 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 8/6/21

JOB NUMBER:	19027
SCALE:	NO SCALE
DATE:	AUGUST 6, 2021
DRAWN BY:	BM
DESIGNED BY:	CVS/BM
CHECKED BY:	CVS
SHEET NO.	REVISION
M-703	△

INTERIOR LIGHTING

SUBSCRIPTS INDICATE THE FOLLOWING:

LF-X	=	INDICATES FIXTURE TYPE
E	=	INDICATES EMERGENCY BATTERY BACKUP
a	=	DENOTES SINGLE SWITCH DESIGNATION
a/b	=	DENOTES DUAL SWITCH DESIGNATION

CEILING MTD	WALL MTD	
LF-X b		2' x 4' RECESSED LUMINAIRE
LF-X b		2' x 4' RECESSED LUMINAIRE WITH EMERGENCY BATTERY BACKUP
LF-X b		2' x 2' RECESSED LUMINAIRE
LF-X b		2' x 2' RECESSED LUMINAIRE WITH EMERGENCY BATTERY BACKUP
LF-X b	LF-X b	1' x 4' SURFACE MOUNTED OR SUSPENDED LUMINAIRE
LF-X b	LF-X b	1' x 4' SURFACE MOUNTED OR SUSPENDED LUMINAIRE WITH EMERGENCY BATTERY BACKUP
LF-X	LF-X	4' STRIP LUMINAIRE
LF-X	LF-X	8' STRIP LUMINAIRE
OR LF-X OR LF-X	OR LF-X OR LF-X	EXIT LIGHT WITH ARROW
LF-X b	LF-X	RECESSED OR SURFACE MOUNTED LUMINAIRE
LF-X b	LF-X	RECESSED LUMINAIRE WITH EMERGENCY BATTERY BACKUP
LF-X	LF-X	EMERGENCY LUMINAIRE BATTERY OPERATED
LF-X	LF-X	EMERGENCY REMOTE HEAD

INTERIOR LIGHTING CONTROLS

SUBSCRIPTS INDICATE THE FOLLOWING:

a	=	SWITCH DESIGNATION
D	=	DIMMER
2	=	DOUBLE-POLE
3	=	THREE-WAY
4	=	FOUR-WAY
K	=	KEY-OPERATED
P	=	PILOT LIGHT
T	=	TIMER
L	=	LOW-VOLTAGE
M	=	MOTOR RATED WITH OVERLOAD PROTECTION
IG	=	ISOLATED GROUND
EXP	=	EXPLOSION PROOF
WP	=	WEATHERPROOF
DR	=	DOOR SWITCH

$x	WALL SWITCH 120-277 VOLT, 20 AMP, SINGLE POLE
$$x	MULTIPLE WALL SWITCHES 120-277 VOLT, 20 AMP, MTD IN A SINGLE BOX
OC OR OC	OCCUPANCY SENSOR - CEILING MOUNTED
OC OR OC P P	OCCUPANCY SENSOR - CEILING MOUNTED - WITH AUTOMATIC DIMMING CONTROL PHOTOCELL
PP	POWER PACK
PP D	POWER PACK W/0-10V DIMMING OUTPUT

POWER WIRING DEVICES

SUBSCRIPTS INDICATE THE FOLLOWING:

WP	=	WEATHER PROOF, IN-USE COVER
WR	=	WEATHER RESISTANT WIRING DEVICE
GFCI	=	GROUND FAULT CIRCUIT INTERRUPTER
GF-BF	=	BLANK FACE GROUND FAULT INTERRUPT
IG	=	ISOLATED GROUND
EXP	=	EXPLOSION PROOF
ACT	=	ABOVE COUNTER TOP
TR	=	TAMPER RESISTANT
AFCI	=	ARC FAULT INTERRUPTER
TVSS	=	TRANSIENT VOLTAGE SURGE SUPPRESSOR

	SINGLE RECEPTACLE, 125 VOLT, 2-POLE, 3-WIRE, NEMA 5-20R GROUNDING TYPE
XXX	DUPLEX RECEPTACLE, 125 VOLT, 2-POLE, 3 WIRE, NEMA 5-20R GROUNDING TYPE
XXX (6-60)	SPECIAL PURPOSE RECEPTACLE, NUMBER DENOTES NEMA CONFIGURATION
XXX	QUADRUPLEX RECEPTACLE, 125 VOLT, 2-POLE, 3 WIRE, NEMA 5-20R GROUNDING TYPE
	SINGLE SPECIAL PURPOSE RECEPTACLE, NEMA CONFIGURATION NOTED
	FLOOR MOUNTED DUPLEX RECEPTACLE, 125-VOLT, 2-POLE, 3-WIRE, NEMA 5-20R GROUNDING TYPE
	FLOOR MOUNTED QUADRAPLEX RECEPTACLE, 125-VOLT, 2-POLE, 3-WIRE, NEMA 5-20R GROUNDING TYPE
	RANGE RECEPTACLE, 125/250 VOLT, 3-POLE, 4-WIRE, NEMA 14-50R GROUNDING TYPE
	JUNCTION BOX WALL OR CLNG MOUNTED FLUSH OR SURFACE AS NOTED, 4"X4" SQUARE UNLESS OTHERWISE NOTED
(1) (3) (5) (3)	MULTI-OUTLET SURFACE RACEWAY, SIZE AND NUMBER OF RECEPTACLE AS SCHEDULED. # INDICATES CIRCUIT NUMBER
W W W W	WIREWAY
C C C C	CABLE TRAY
B B B B	PLUGIN OR FEEDER BUS
	WALL MTD SINGLE FACE CLOCK
	WALL MTD DOUBLE FACE CLOCK

POWER DEVICES

M OR 5	MOTOR CONNECTION (5 HP INDICATED)
	DISCONNECT SWITCH (ENCLOSURE TYPE, SIZE, AND FUSING, IF REQUIRED, DESIGNATED ON DRAWINGS)
	PANELBOARD, SURFACE MOUNTED
	PANELBOARD, RECESSED
	ENCLOSED CIRCUIT BREAKER (ENCLOSURE TYPE, SIZE DESIGNATED ON DRAWINGS)
	MOTOR CONTROLLER (ENCLOSURE TYPE, SIZE DESIGNATED ON DRAWINGS)
	COMBINATION STARTER/CIRCUIT BREAKER (ENCLOSURE TYPE, SIZE DESIGNATED ON DRAWINGS)
	VARIABLE FREQUENCY DRIVE (ENCLOSURE TYPE, SIZE DESIGNATED ON DRAWINGS)
	DRY TYPE TRANSFORMER - FLOOR MOUNTED ON 4" HIGH HOUSEKEEPING PAD
MCD	MAGNETIC CONTACT, DOOR MOUNTED
MCW	MAGNETIC CONTACT, WINDOW MOUNTED
M	PASSIVE INFRARED MOTION DETECTOR, ARROW DENOTES CURTAIN DIRECTION

FIRE ALARM/SUPPRESSION SYSTEM DEVICES

EOL	END OF LINE RESISTOR
FCP	FIRE ALARM CONTROL PANEL
FSA	FIRE ALARM ANNUNICATOR PANEL
FAC	FIRE ALARM COMMUNICATOR
MIC	REMOTE MIC
	FIRE ALARM MANUAL STATION X=H- HALON F- FOAM C- CARBON DIOXIDE W- WET CHEMICAL D- DRY CHEMICAL P- MANUAL PULL STATION
	FIRE ALARM SPEAKER-HORN/STROBE LIGHT
	FIRE ALARM HORN OR SPEAKER
	FIRE ALARM BELL/LIGHT
	WATER MOTOR GONG
	FIRE ALARM STROBE LIGHT
	WALL MOUNTED FIRE ALARM STROBE LIGHT
X	SMOKE DETECTOR X=P- PHOTOELECTRIC BT- BEAM TRANSMITTER I- IONIZATION BR- BEAM RECEIVER
OR X	DUCT MOUNTED SMOKE DETECTOR
	HEAT DETECTOR, SUBSCRIPT DENOTES THE FOLLOWING X=F-FIXED TEMPERATURE R-RATE OF RISE R/F-COMBINATION RATE OF RISE AND FIXED
	TAMPER SWITCH CONNECTION
	FLOW SWITCH CONNECTION
	DOOR HOLDER
	PRESSURE SWITCH
	LEVEL SWITCH
	VALVE WITH TAMPER SWITCH
	MUSHROOM HEAD EMERGENCY PUSHBUTTON SWITCH
	FIREMANS TELEPHONE STATION
	CO_2 FIRE EXTINGUISHER
AMM	ADDRESSABLE MONITOR MODULE
CO	CARBON MONOXIDE DETECTOR

INTERIOR CONDUIT & WIRE

	CONDUIT CONCEALED IN WALL OR CEILING TIC MARKS INDICATE NUMBER OF WIRES. #12 IF NOT OTHERWISE SHOWN. CONDUIT SHALL BE 3/4 " UNLESS OTHERWISE NOTED. GROUND PHASE(S) NEUTRAL
	CONDUIT EXPOSED OR CONCEALED
	CONDUIT RUN UNDERGROUND OR IN CONCRETE
LP1-2	HOMERUN TO PANEL (PANEL LP1 CIRCUIT 2 INDICATED)
	SIGNIFIES MULTIPLE CIRCUITS IN ONE CONDUIT
X	EXPLOSION PROOF CONDUIT SEAL
	CONDUIT WITH END CAPPED
	CONDUIT TURNED UP
	CONDUIT TURNED DOWN

EXISTING	NEW	EXTERIOR
35/3	35/3	POLE, LENGTH AND CLASS AS INDICATED
3-25	3-25	TRANSFORMER BANK POLE MOUNTED, SHOWN AS THREE PHASE 25 KVA TRANSFORMERS
25	25	SINGLE PHASE TRANSFORMER, POLE MOUNTED 25 KVA NOTED
T 100	T 100	PAD MOUNTED TRANSFORMER, 100 KVA NOTED
		FUSE CUTOUT WITH FUSE SIZE AND TYPE NOTED
		DISCONNECT SWITCH OR SECTIONALIZING SWITCH
EG	G	BURIED GROUND WIRE
EG	G	GROUND WIRE IN OR UNDER FLOOR SLAB
EG	G	GROUND WIRE EXPOSED
		GROUND CONNECTION OR EQUIPMENT BOND
EG	RC	ROOF CONDUCTOR
		POLE MOUNTED LUMINAIRE
XXX	XXX	MANHOLE, HANDHOLE, OR PULLBOX, SUBSCRIPT DENOTES THE FOLLOWING: EMH ELECTRICAL MANHOLE CMH COMMUNICATIONS MANHOLE EHH ELECTRICAL HANDHOLE CHH COMMUNICATIONS HANDHOLE EPB ELECTRICAL PULLBOX CPB COMMUNICATIONS PULLBOX
XXX OR XXX XXX OR XXX	XXX OR XXX XXX OR XXX	WALLPACK EXTERIOR LUMINAIRE
		WALLPACK EXTERIOR LUMINAIRE WITH EMERGENCY BATTERY
10-3/4 W	10-3/4 W	GROUND ROD, SIZE AS NOTED 3/4" X 10' (W DENOTES INSTALLATION IN WELL)
24	24	LIGHTNING ROD, (24 INCHES HIGH NOTED)

COMMUNICATION

SUBSCRIPTS INDICATE THE FOLLOWING:

V	=	VOICE OUTLET
D	=	DATA OUTLET

TYPE OF OUTLET — 1V/1D — # OF OUTLETS

	RJ-45 OUTLET - WALL-MOUNTED, MOUNT 18" AFF, UNLESS OTHERWISE NOTED
	FIBER OUTLET, DUPLEX LC CONNECTORS - WALL-MOUNTED, MOUNT 18" AFF, UNLESS OTHERWISE NOTED
	RJ-45 OUTLET - FLOOR MOUNTED
	FIBER OUTLET, DUPLEX LC CONNECTORS - FLOOR MOUNTED
	ONE POSITION VOICE OUTLET (RJ-45) - WHITE JACK - WALL-MOUNTED AT 48" AFF, UNLESS OTHERWISE NOTED
XX	CABLE TV OUTLET, MOUNT AT HEIGHT INDICATED ON FLOOR PLANS - REQUIRES A TYPE F COMPRESSION CONNECTOR
W1	RJ-45 OUTLET FOR WIRELESS ACCESS POINT - WALL-MOUNTED, MOUNT 8'-0" AFF, UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. THE MINIMUM STANDARD FOR ALL WORK SHALL BE THE LATEST EDITION OF THE INTERNATIONAL BUILDING CODE WITH IN STATE AMENDMENTS AND THE NATIONAL ELECTRICAL CODE (NEC).
2. ALL ELECTRICAL WORK SHALL BE PERFORMED BY AN IN-STATE LICENSED ELECTRICIAN.
3. ALL PERMITS NEEDED TO LEGALLY PERFORM THE ELECTRICAL WORK SHALL BE OBTAINED BY THE CONTRACTOR PRIOR TO START OF WORK. COST OF PERMITTING IS BY THE CONTRACTOR.
4. AT COMPLETION OF THE WORK, A CERTIFICATE OF COMPLIANCE FROM THE LOCAL AHJ OVER THE ELECTRICAL WORK SHALL BE PROVIDED TO THE ENGINEER AND OWNER. COST OF ELECTRICAL INSPECTION IS BY THE CONTRACTOR.
5. ALL MATERIALS USED IN THE PROJECT GENERALLY SHALL BE NEW AND UNUSED, UNLESS OTHERWISE NOTED ON THE DRAWINGS. ALL NEW MATERIALS SHALL BE LISTED BY UL OR OTHER ACCEPTABLE LISTING AGENCY, WHERE A LISTING EXISTS.
6. THE CONTRACTOR SHALL VISIT THE SITE(S) PRIOR TO BIDDING TO FAMILIARIZE THEMSELVES WITH PROJECT REQUIREMENTS AND EXISTING CONDITIONS.
7. FIRESTOP ALL NEW CONDUIT INSTALLED THROUGH EXISTING OR NEW FIRE RATED ASSEMBLIES.
8. SHOP DRAWINGS SHALL BE SUBMITTED ON ALL ELECTRICAL MATERIALS AND EQUIPMENT FOR ACCEPTANCE PRIOR TO PURCHASE BY THE CONTRACTOR.
9. WHEN AN ITEM DEMOLISHED IS REMOVED, REMOVE ALL CONCRETE PADS, FASTENERS, CONDUIT AND WIRING. SCARIFY SURFACE AND RESTORE TO MATCH EXISTING SURROUNDING SURFACE, INCLUDING PAINTING TO MATCH.
10. ALL NEW WIRING SHALL BE ENCLOSED IN AN APPROVED RACEWAY SYSTEM. OPEN WIRING IS PROHIBITED.
11. CIRCUIT BREAKERS USED FOR HVAC EQUIPMENT LOADS SHALL BE HACR TYPE.
12. ENSURE DEDICATED ELECTRICAL SPACE IS PROVIDED ABOVE AND BELOW ELECTRICAL PANELS IN ACCORDANCE WITH NEC ARTICLE 110.26.
13. UP TO 3 CIRCUITS MAY BE COMBINED IN ONE CONDUIT, AS LONG AS NEC DERATING RULES ARE FOLLOWED.
14. ALL CIRCUITS TO HAVE A DEDICATED NEUTRAL. COMBINED NEUTRALS AND MULTI-WIRE CIRCUITS ARE NOT TO BE USED EXCEPT POSSIBLY TO COORDINATE WITH SYSTEMS FURNITURE. SEE POWER PLAN.
15. 120 VOLT CIRCUITS THAT EXCEED 75 LINEAR CIRCUIT FEET SHALL BE INCREASED TO #10 AWG AS A GENERAL RULE. OTHER CIRCUITS WILL BE DESIGNED SPECIFICALLY WITH VOLTAGE DROP CONSIDERED IN THE LAYOUT.
16. COORDINATE ALL MOTOR STARTERS, FEEDERS AND DISCONNECT SWITCHES FOR HVACE AND OTHER UTILIZATION EQUIPMENT ACTUALLY PROVIDED IN ACCEPTED SHOP DRAWINGS.
17. IN ORDER TO COMPLY WITH OSHA REQUIREMENTS, NO OPERATOR DEVICE OF ANY PANEL OR DISCONNECT OR MOTOR CONTROL SHALL BE HIGHER THAN 6'-6" AFF.
18. PROVIDE AN EXTERIOR RATED SERVICE RECEPTACLE WITHIN 25 FEET HORIZONTALLY OF ANY EXTERIOR OR ROOFTOP HVAC OUTDOOR UNITS (HEATING OR AIR CONDITIONING ONLY).
19. SUPPORT ALL LUMINAIRES FROM THE STRUCTURE, NOT FROM THE SUSPENDED CEILING GRID. ALSO INTERLOCK THE LUMINAIRES TO THE GRID SYSTEM USING AFTERMARKET EARTHQUAKE CLIPS (SIMILAR TO ERICO/CADDY FASTENERS OR T&B/STEEL CITY).
20. DEVICE PLATES SHALL BE INSTALLED PLUMB AND JUMBO OVERSIZED PLATES SHALL NOT BE USED.
21. NEW RECEPTACLES SHALL BE INSTALLED WITH GROUND PIN ORIENTATION TO MATCH EXISTING. IN NEW CONSTRUCTION, GROUND PIN DOWN ABOVE COUNTERS OR WORK BENCHES, AND UP FOR LOW WALL MOUNTED DEVICES.
22. AT COMPLETION OF PROJECT, ALL ELECTRICAL, TELECOMMUNICATIONS, AND ELECTRONIC SAFETY SYSTEMS SHALL BE FULLY OPERATIONAL.
23. INSTALL A NYLON PULLSTRING IN ALL SPARE CONDUITS, ACCESSIBLE AT BOTH ENDS. CAP OFF SPARE CONDUITS ON BOTH ENDS.
24. EGRESS LUMINAIRES AND EXIT SIGNS REQUIRE AN UNSWITCHED HOT.
25. WHERE DUPLEX RECEPTACLES ARE INDICATED GENERALLY BACK TO BACK ON OPPOSITE SIDES OF A PARTY WALL, THE RECEPTACLES SHALL NOT BE INSTALLED IN THE SAME STUD SPACE, BUT SHALL BE SEPARATED BY AT LEAST ONE STUD SPACE.
26. PROVIDE SIGN WITH ESTIMATED FAULT CURRENT AND DATE CALCULATED ON THE MAIN SERVICE DISCONNECT ENCLOSURE. PROVIDE COORDINATION STUDY AND ARC FLASH STUDY, AND APPLY JOB SPECIFIC ARC FLASH HAZARD WARNING LABELS ON ALL SWITCHBOARDS, SWITCHGEAR, MCC'S AND PANELBOARDS.
27. FOR ANY CIRCUIT BREAKER 1200 AMPERE OR LARGER, PROVIDE A MAINTENANCE SWITCH OR ZONE INTERLOCKING OR OTHER MEANS TO COMPLY WITH NEC ARTICLE 240.87.

REVISION NUMBER	REVISIONS	DATE	BY

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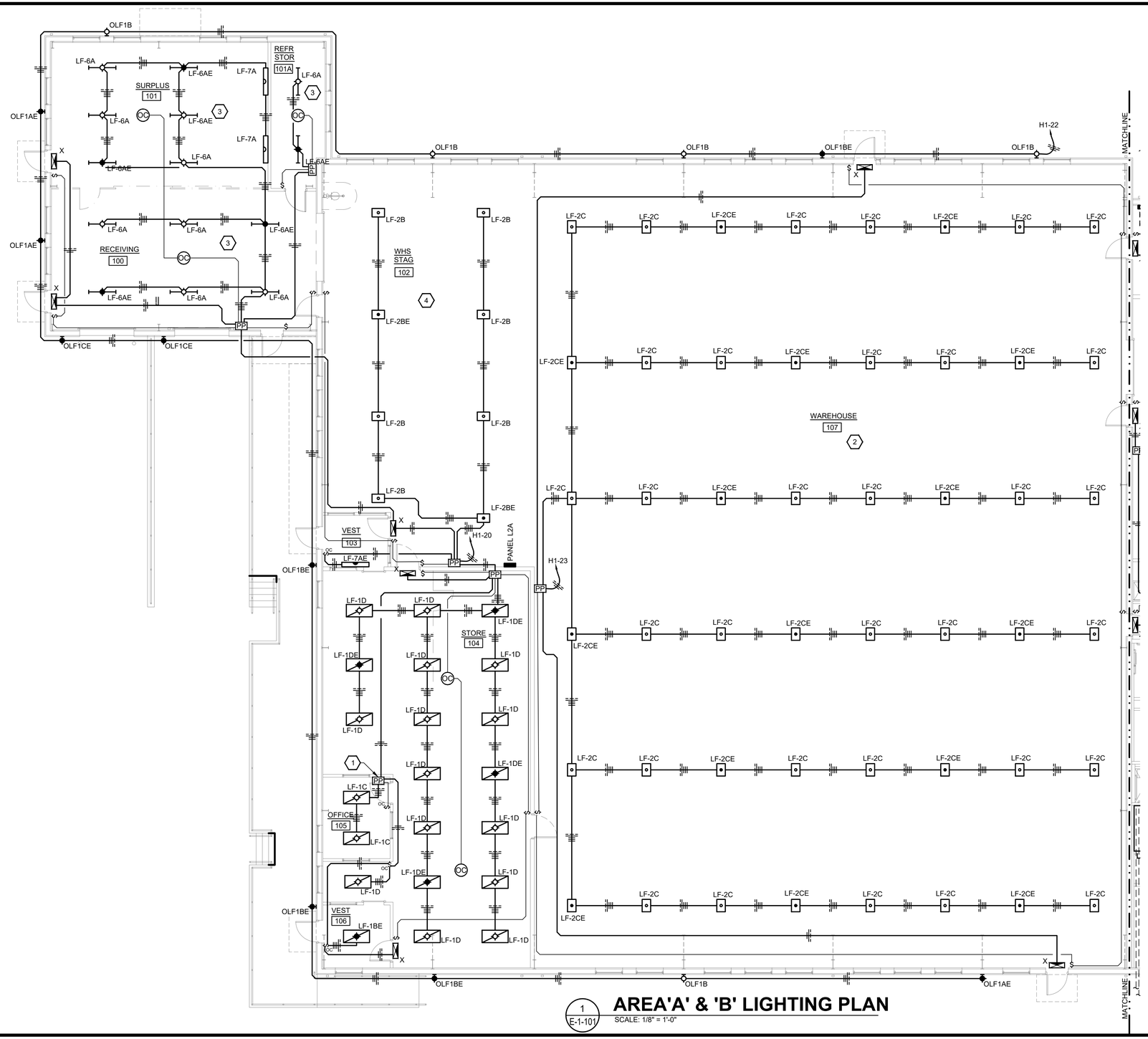
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
ELECTRICAL LEGEND AND GENERAL NOTES

PATRICK JAYE BAILEY REGISTERED 22777 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-001	△



GENERAL NOTES:

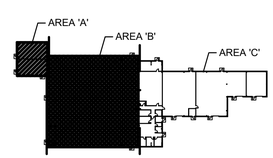
1. REFER TO POWER PLANS FOR PANELBOARD LOCATIONS.
2. REFER TO SPECIFICATION SECTION 260548 FOR MOUNTING/SUPPORT REQUIREMENTS FOR LUMINAIRES.
3. OCCUPANCY SENSORS SHALL BE MOUNTED ON A VIBRATION FREE SURFACE AND SHALL BE LOCATED AT LEAST 6'-0" FROM DIFFUSERS. DO NOT MOUNT SENSORS CLOSER THAN 10'-0" FROM EACH OTHER.
4. PROVIDE AN UNSWITCHED LIGHTING CIRCUIT (NORMAL POWER) TO EACH LUMINAIRE CONTAINING AN EMERGENCY BATTERY DRIVER.
5. 0-10VDC DIMMING CONDUCTORS (CLASS 2) SHALL BE ROUTED IN SEPARATE CONDUIT FROM THE POWER CONDUCTORS.
6. LIGHTING CONTROL CABLE SHALL BE "DAISY CHAINED" BETWEEN LIGHTING CONTROL DEVICES (OCCUPANCY SENSOR, POWER/RELAY PACKS, WALL PODS, ETC.) WITHIN EACH ROOM AS SHOWN. CABLING SHALL BE ROUTED ABOVE CEILING AND SECURED WITH BRIDLE RINGS OR OTHER SIMILAR WIRE METHODS.
7. REFER TO ARCHITECTURAL ELEVATIONS FOR EXTERIOR LIGHT FIXTURE MOUNTING HEIGHTS.

SHEET KEYNOTES:

1. REFER TO POWER PLANS AND DETAILS FOR INTERCONNECTION TO RECEPTACLE CONTROL IN THIS AREA.
2. LUMINAIRES IN THIS AREA TO BE MOUNTED AT 28'-0".
3. LUMINAIRES IN THIS AREA TO BE MOUNTED AT 16'-0".
4. LUMINAIRES IN THIS AREA TO BE MOUNTED AT 14'-0".

1 E-1-101 AREA'A' & 'B' LIGHTING PLAN

SCALE: 1/8" = 1'-0"



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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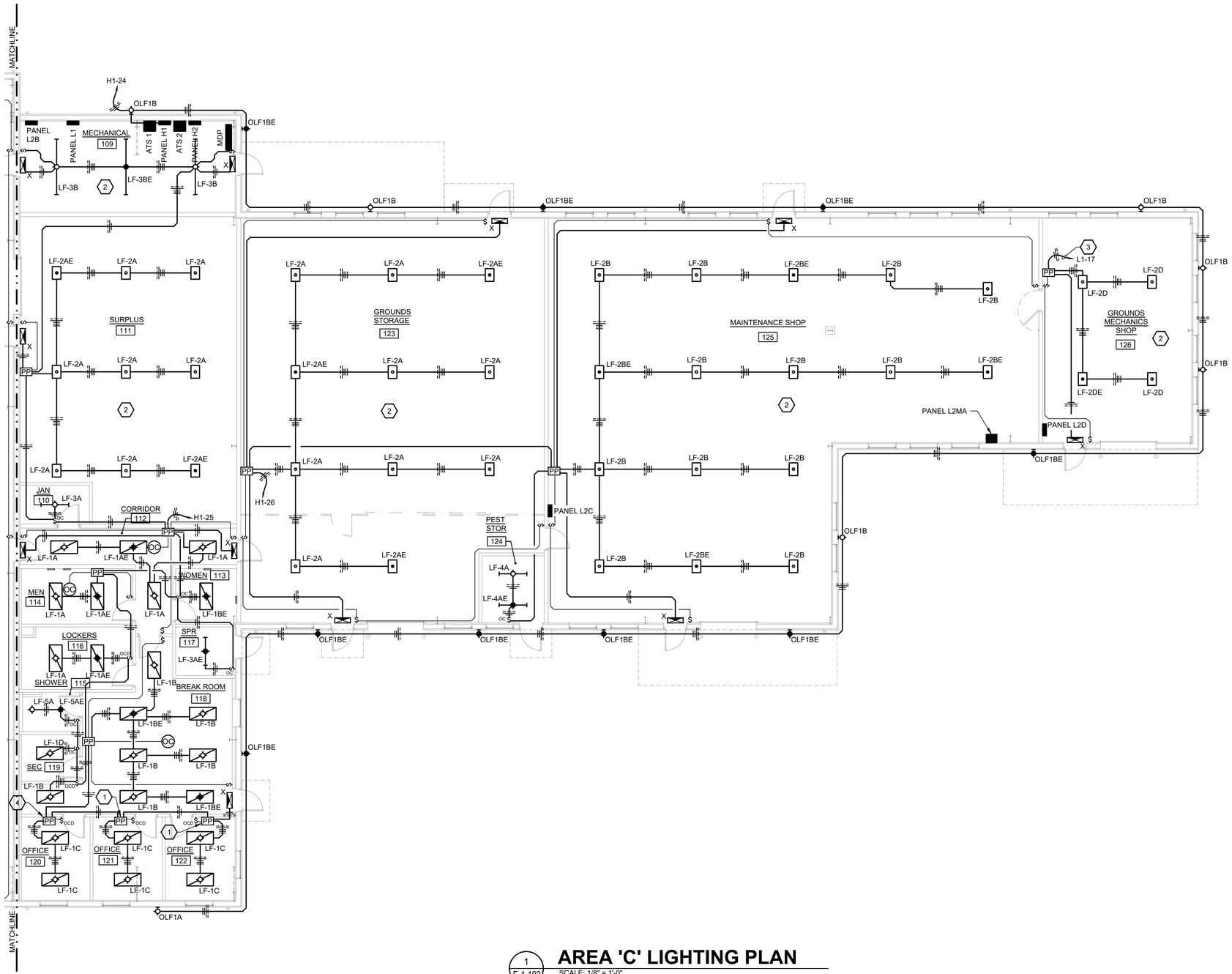
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENNANCE/SUPPORT FACILITY
WAREHOUSE AREA
AREA'A' & 'B' LIGHTING PLAN

PATRICK JAYE BALL — REGISTERED — 22177 — STATE OF WEST VIRGINIA — PROFESSIONAL ENGINEER — 8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-101	△



1 E-1-102

AREA 'C' LIGHTING PLAN

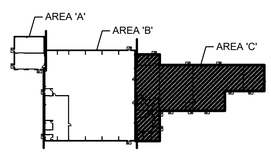
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. REFER TO POWER PLANS FOR PANELBOARD LOCATIONS.
2. REFER TO SPECIFICATION SECTION 260548 FOR MOUNTING/SUPPORT REQUIREMENTS FOR LUMINAIRES.
3. OCCUPANCY SENSORS SHALL BE MOUNTED ON A VIBRATION FREE SURFACE AND SHALL BE LOCATED AT LEAST 6'-0" FROM DIFFUSERS. DO NOT MOUNT SENSORS CLOSER THAN 10'-0" FROM EACH OTHER.
4. PROVIDE AN UNSWITCHED LIGHTING CIRCUIT (NORMAL POWER) TO EACH LUMINAIRE CONTAINING AN EMERGENCY BATTERY DRIVER.
5. 0-10VDC DIMMING CONDUCTORS (CLASS 2) SHALL BE ROUTED IN SEPARATE CONDUIT FROM THE POWER CONDUCTORS.
6. LIGHTING CONTROL CABLE SHALL BE "DAISY CHAINED" BETWEEN LIGHTING CONTROL DEVICES (OCCUPANCY SENSOR, POWER/RELAY PACKS, WALL PODS, ETC.) WITHIN EACH ROOM AS SHOWN. CABLING SHALL BE ROUTED ABOVE CEILING AND SECURED WITH BRIDLE RINGS OR OTHER SIMILAR WIRE METHODS.
7. REFER TO ARCHITECTURAL ELEVATIONS FOR EXTERIOR LIGHT FIXTURE MOUNTING HEIGHTS.

SHEET KEYNOTES:

1. REFER TO POWER PLANS AND DETAILS FOR INTERCONNECTION TO RECEPTACLE CONTROL IN THIS AREA.
2. LUMINAIRES IN THIS AREA TO BE MOUNTED AT 14'-0".
3. CIRCUIT SHALL BE TEMPORARILY CONNECTED TO PANEL L2D FOR PHASE 1.



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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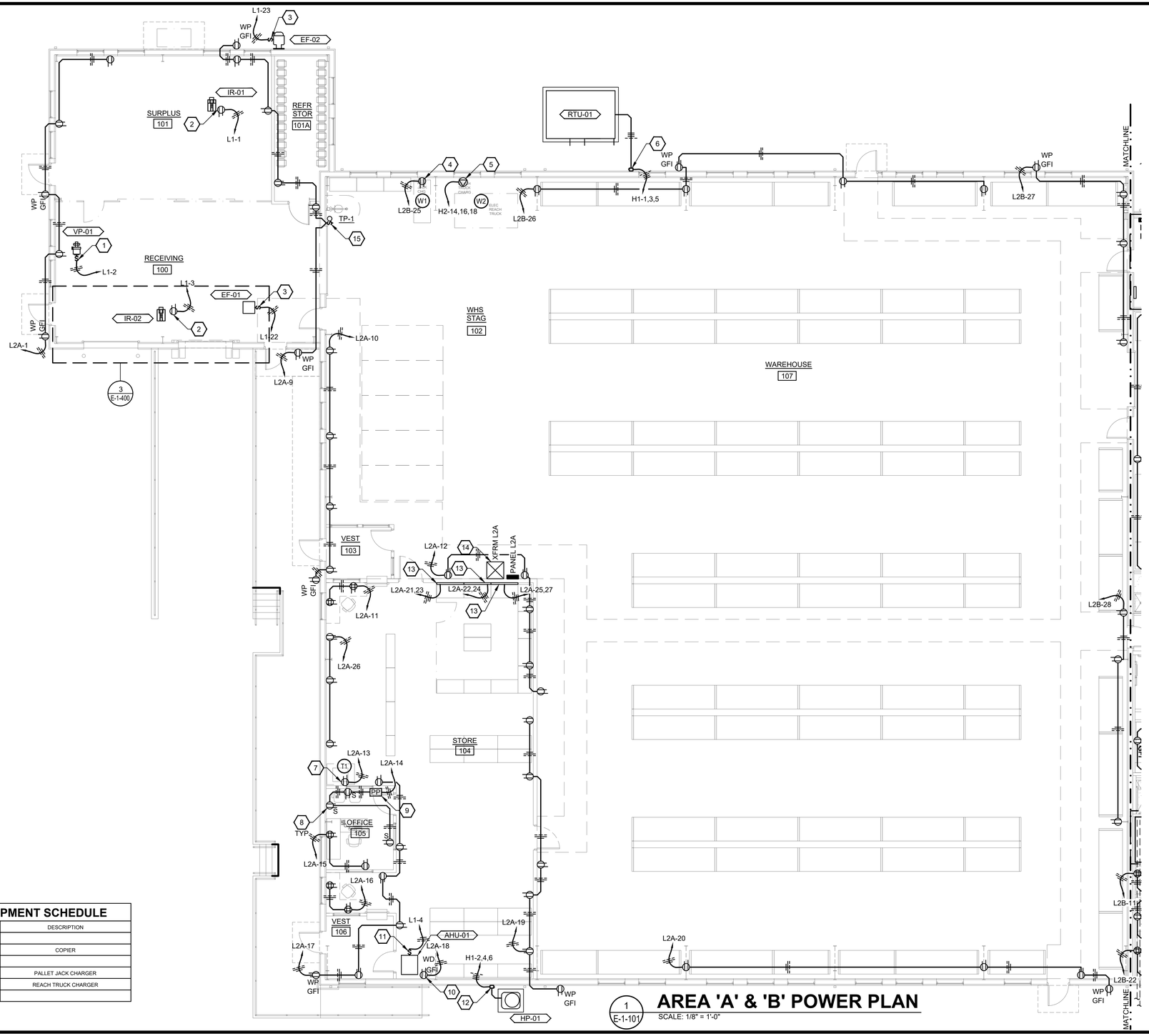
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
AREA 'C' LIGHTING PLAN

PATRICK JAYE BAILEY — REGISTERED — 022777 — STATE OF WEST VIRGINIA — PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-102	



1 E-1-101 **AREA 'A' & 'B' POWER PLAN**

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

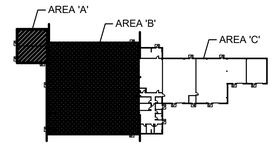
1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

SHEET KEYNOTES:

1. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR RADIANT HEATING PUMP.
2. PROVIDE NEMA 5-15 RECEPTACLE FOR RADIANT HEATING BURNER. MOUNT WITHIN 12" OF BURNER UNIT.
3. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWTICH FURNISHED WITH EXHAUST FAN.
4. PROVIDE NEMA 5-20 RECEPTACLE FOR PALLET JACK CHARGER. VERIFY RECEPTACLE TYPE WITH OWNER PROVIDED EQUIPMENT PRIOR TO INSTALLATION.
5. PROVIDE NEMA L16-20 RECEPTACLE FOR REACH TRUCK CHARGER. VERIFY RECEPTACLE TYPE WITH OWNER PROVIDED EQUIPMENT PRIOR TO INSTALLATION.
6. PROVIDE NEMA 3R 60 AMP NON FUSED SAFETY SWITCH FOR RTU.
7. PROVIDE NEMA 5-20 RECEPTACLE FOR COPIER.
8. OCCUPANCY CONTROLLED RECEPTACLE. PROVIDE LABEL ON FACEPLATE. "RECEPTACLE CONTROLLED BY OCCUPANCY SENSOR."
9. RECEPTACLE CONTROL POWER PACK. REFER TO LIGHTING PLANS AND DETAILS FOR INTERCONNECTION TO LIGHTING CONTROL IN THIS AREA.
10. PROVIDE NEMA 5-20 RECEPTACLE FOR WATER DISPENSER.
11. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR AHU.
12. PROVIDE NEMA 3R 30A THREE POLE NON-FUSED DISCONNECT FOR HP.
13. PROVIDE WALL MOUNTED 4' LONG PLUG STRIP (WIREMOLD AL20GBA406 OR EQUIVALENT) AT 48" AFF.
14. PROVIDE MOUNTING BRACKET FOR TRANSFORMER. MOUNT TOP OF TRANSFORMER AS CLOSE TO BOTTOM OF STRUCTURE AS POSSIBLE.
15. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.

EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
T1	COPIER
W1	PALLET JACK CHARGER
W2	REACH TRUCK CHARGER



KEYPLAN

REVISION NUMBER	REVISIONS	DATE	BY

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ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING

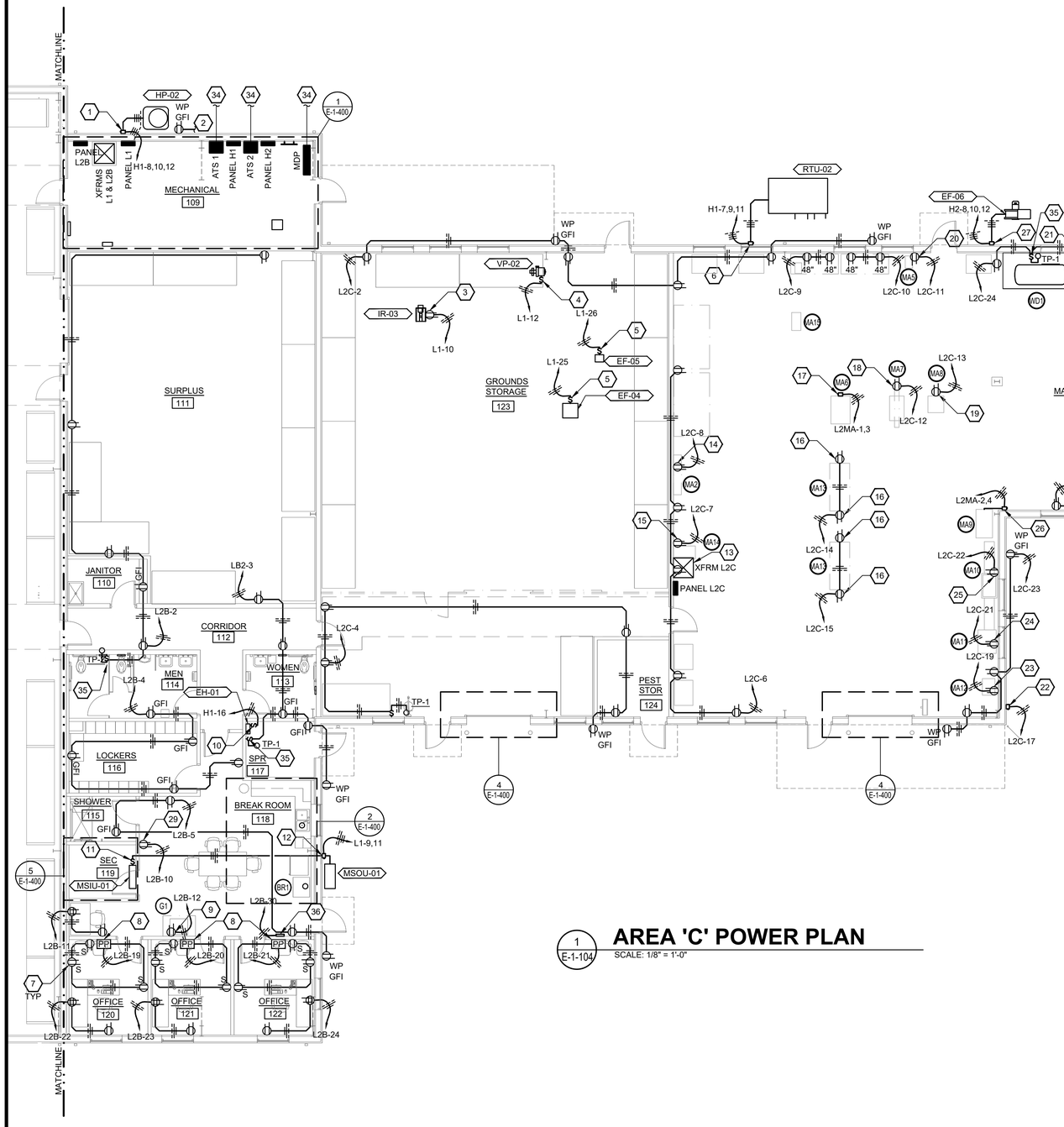
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE AREA
AREA 'A' & 'B' POWER PLAN

PATRICK JAYE BAILEY REGISTERED PROFESSIONAL ENGINEER STATE OF WEST VIRGINIA 22977
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	E-1-103
REVISION	△



AREA 'C' POWER PLAN

1 / E-1-104

SCALE: 1/8" = 1'-0"

EQUIPMENT SCHEDULE

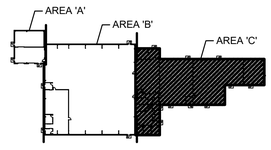
ITEM	DESCRIPTION
WD1	AIR COMPRESSOR
G1	COPIER
BR1	ICE MACHINE
MA2	PANEL SAW
MA5	DRILL PRESS
MA6	TABLE SAW
MA7	JOINTER
MA8	PLANER/MOLDER
MA9	SHAPER
MA10	MITER SAW
MA11	RADIAL ARM SAW
MA12	FINISHER
MA13	WORK BENCH
MA14	BAND SAW
MA15	DUST COLLECTOR
ME5	MIG WELDER
ME6	PLASMA CUTTER
ME8	DRILL PRESS
ME9	20G PARTS WASH
ME10	BLAST CABINET

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

⬡ SHEET KEYNOTES:

1. PROVIDE NEMA 3R 30A THREE POLE NON-FUSED DISCONNECT FOR HP.
2. SEE SHEET E-1-400, ENLARGED MECHANICAL ROOM, FOR CONTINUATION.
3. PROVIDE NEMA 5-15 RECEPTACLE FOR RADIANT HEATING BURNER. MOUNT WITHIN 12" OF BURNER UNIT.
4. PROVIDE 15A SINGLE POLE TOGGLE SWTICH DISCONNECT FOR RADIANT HEATING PUMP.
5. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWTICH FURNISHED WITH EXHAUST FAN.
6. PROVIDE NEMA 3R 30 AMP NON-FUSED SAFETY SWITCH FOR RTU.
7. OCCUPANCY CONTROLLED RECEPTACLE. PROVIDE LABEL ON FACEPLATE. "RECEPTACLE CONTROLLED BY OCCUPANCY SENSOR."
8. RECEPTACLE CONTROL POWER PACK. REFER TO LIGHTING PLANS AND DETAILS FOR INTERCONNECTION TO LIGHTING CONTROL IN THIS AREA.
9. PROVIDE NEMA 5-20 RECEPTACLE FOR COPIER.
10. PROVIDE ELECTRICAL CONNECTION TO INTEGRAL DISCONNECT IN ELECTRIC UNIT HEATER.
11. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWTICH FURNISHED WITH INDOOR MINI SPLIT UNIT.
12. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWTICH FURNISHED WITH OUTDOOR MINI SPLIT UNIT.
13. PROVIDE MOUNTING BRACKET FOR TRANSFORMER. MOUNT TOP OF TRANSFORMER AS CLOSE TO BOTTOM OF STRUCTURE AS POSSIBLE.
14. PROVIDE NEMA 5-20 RECEPTACLE FOR PANEL SAW.
15. PROVIDE NEMA 5-20 RECEPTACLE FOR BAND SAW.
16. PROVIDE FLOOR MOUNTED PEDESTAL NEMA 5-20 RECEPTACLES AT END OF WORKBENCHES.
17. PROVIDE NEMA 12, 30 AMP NON-FUSED DISCONNECT FOR TABLE SAW.
18. PROVIDE NEMA 5-20 RECEPTACLE FOR JOINTER.
19. PROVIDE NEMA 5-20 RECEPTACLE FOR PLANER/MOLDER.
20. PROVIDE NEMA 5-20 RECEPTACLE FOR DRILL PRESS.
21. PROVIDE NEMA 12, 30 AMP DISCONNECT FOR AIR COMPRESSOR.
22. PROVIDE NEMA 3R, 30 AMP DISCONNECT FOR SLIDE GATE.
23. PROVIDE NEMA 5-20 RECEPTACLE FOR FINISHER.
24. PROVIDE NEMA 5-20 RECEPTACLE FOR RADIAL ARM SAW.
25. PROVIDE NEMA 5-20 RECEPTACLE FOR MITER SAW.
26. PROVIDE NEMA 12, 30 AMP DISCONNECT FOR SHAPER.
27. PROVIDE NEMA 3R, 30 AMP DISCONNECT FOR EXHAUST FAN.
28. PROVIDE NEMA 5-20 RECEPTACLE FOR BLAST CABINET.
29. PROVIDE NEMA 5-20 RECEPTACLE FOR TIME CLOCK.
30. PROVIDE WIRING FOR WELDING HOOD CONTROL SWITCH. REFER TO MECHANICAL FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
31. PROVIDE NEMA 1, 30 AMP DISCONNECT WITH NEMA 10-30 RECEPTACLE FOR WELDER.
32. PROVIDE NEMA 1, 30 AMP DISCONNECT WITH NEMA L14-30 RECEPTACLE FOR PLASMA CUTTER.
33. PROVIDE NEMA 5-20 RECEPTACLE FOR DRILL PRESS.
34. REFER TO C-0-107 FOR CONTIUATION AND E-1-900 FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
35. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
36. FUEL TANK SYSTEM CONTROL PANEL.



KEYPLAN

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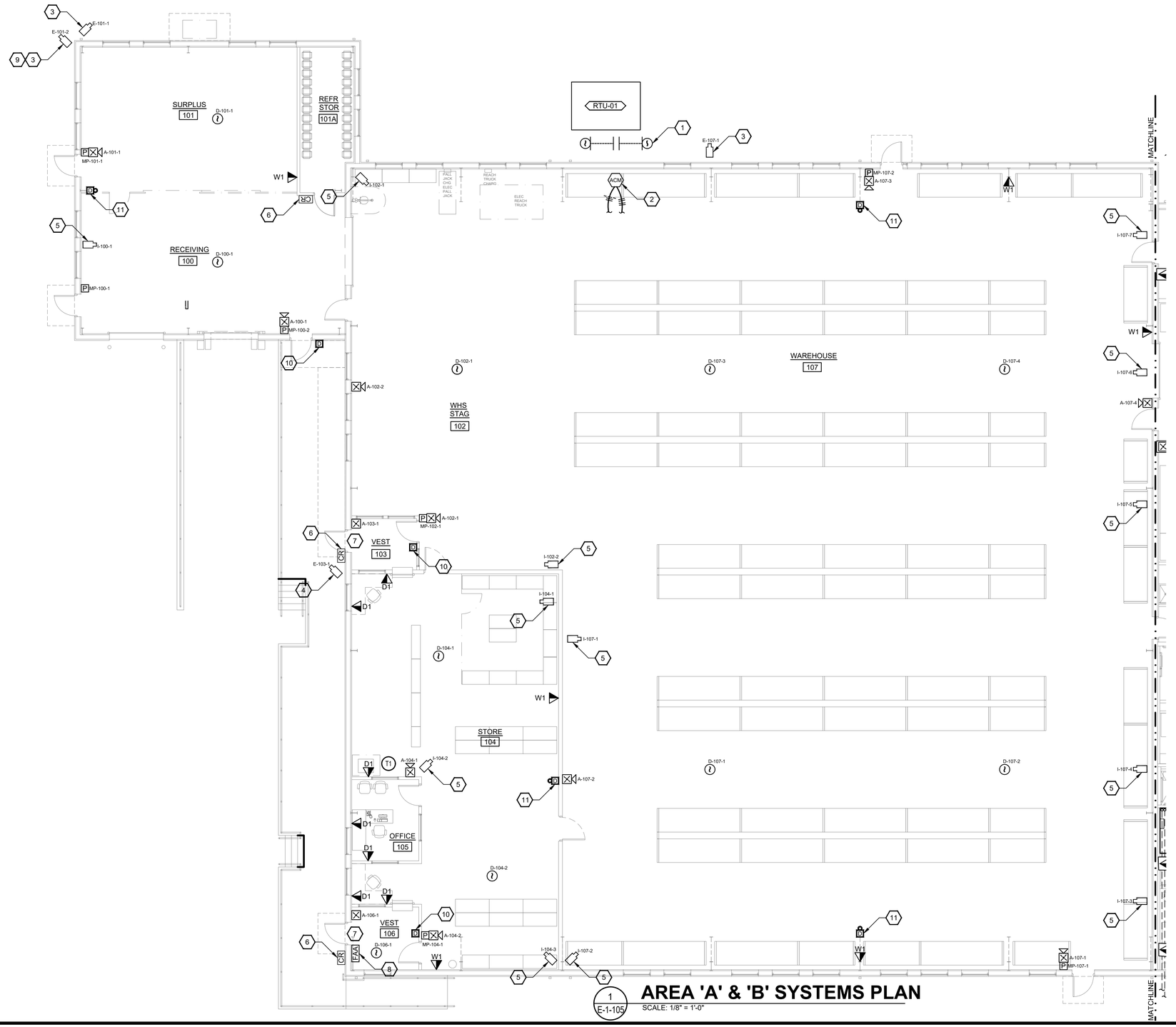
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS AREA
AREA 'C' POWER PLAN

PATRICK JAY BAILEY, REGISTERED, 022777, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-104	



1 E-1-105

AREA 'A' & 'B' SYSTEMS PLAN

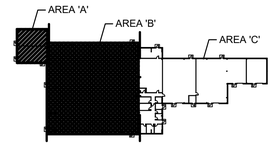
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. INSTALL 1" CONDUIT FROM EACH TELECOMMUNICATIONS OUTLET TO ABOVE CEILING. PROVIDE NYLON BUSHINGS CONDUIT CONNECTORS FOR CABLE PROTECTION.
2. REFER TO DIVISION 27 SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
3. WHERE NOTED FOR DEVICES AND/OR WIRING TO BE FURNISHED AND INSTALLED BY DOOR HARDWARE INSTALLER, THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEVICE BACKBOXES AND CONDUIT ROUGH-IN INSTALLATION.
4. REFER TO SHEET E-500 FOR ACCESS CONTROL SYSTEM / DOOR HARDWARE DETAIL.
5. REFER TO ARCHITECTURAL ELEVATIONS, SHEETS A-1-200 AND A-1-201, FOR EXTERIOR CAMERA MOUNTING HEIGHTS.
6. COORDINATE WITH DOOR HARDWARE INSTALLER FOR ALL REQUIRED ACCESS CONTROL CONNECTIONS AND ROUGH-IN REQUIREMENTS.
7. FIRE ALARM SYSTEM SHALL BE CONNECTED AS SHOWN ON THE MANUFACTURER'S SUBMITTAL DRAWINGS, WITH NUMBER OF WIRES AND CONDUIT SIZED AS REQUIRED.
8. THE FIRE ALARM SYSTEM SHALL BE MONITORED BY A U.L. APPROVED CENTRAL MONITORING STATION. THE MONITORING STATION INFORMATION AND THE CORRESPONDING U.L. FILE NUMBER SHALL BE PROVIDED TO THE PROPER APPROVAL AGENCIES BY THE SUCCESSFUL FIRE ALARM MANUFACTURER / SUPPLIER.
9. CONTRACTOR SHALL REFER TO MECHANICAL / FIRE PROTECTION DRAWINGS FOR EXACT LOCATIONS OF ALL TAMPER AND FLOW SWITCHES REQUIRED FOR THE SPRINKLER SYSTEM, INCLUDING EXTERIOR. SWITCHES SHALL BE MONITORED BY THE FIRE ALARM SYSTEM. ALL EXTERIOR FIRE ALARM LINES AHLL BE PROVIDED WITH SURGE PROTECTION.
10. ANY DUCT SMOKE DETECTORS FOR HVAC UNITS THAT ARE NOT DIRECTLY ACCESSIBLE SHALL BE PROVIDED WITH REMOTE-MOUNTED TEST SWITCHES THAT ARE MOUNTED IN AN ACCESSIBLE LOCATION AND LABELED AS TO WHICH UNIT IS MONITORED.
11. ALL FIRE ALARM INDICATING DEVICES ARE TO BE INSTALLED AT 80" OR 6" BELOW CEILING, WHICHEVER IS LOWER.
12. MANUAL PULL STATIONS ARE TO BE INSTALLED NOT LESS THAN 42" AFF OR MORE THAN 48" AFF (TO OPERATING HANDLE).
13. ALL CABLING SHALL BE INSTALLED IN CONDUIT.
14. REFER TO SHEET E-1-901 FOR FIRE ALARM SYSTEM RISER DIAGRAM.
15. ALL DATA RACKS, DATA CABLING, DATA OUTLETS, DATA JACKS, CABLE SUPPORTS, INSTALLATION AND TERMINATION SHALL BE INCLUDED IN THE PROJECT.

SHEET KEYNOTES:

1. PROVIDE DUCT SMOKE DETECTOR WITH WEATHERPROOF ENCLOSURE. INSTALL IN AIR DUCT FOR RTU. COORDINATE QUANTITIES AND PLACEMENT WITH LOCAL CODE REQUIREMENTS.
2. ADDRESSABLE FIRE ALARM CONTROL MODULE FOR DUCT SMOKE DETECTOR. PROVIDE FIRE ALARM SIGNALING LINE CIRCUIT (SLC WIRING) TO FIRE ALARM CONTROL PANEL. PROVIDE CONDUIT/WIRING TO HVAC UNIT CONTROLS FOR UNIT SHUTDOWN UPON ACTIVATION OF ASSOCIATED DUCT SMOKE DETECTOR. COORDINATE LOCATION WITH MECHANICAL CONTRACTOR.
3. PROTECTIVE SERVICES CAMERA. PROVIDE EXTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-902 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.
4. GSD AGENCY CAMERA. PROVIDE EXTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-903 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.
5. GSD AGENCY CAMERA. PROVIDE INTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-903 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.
6. CARD READER. MOUNT AT 42" AFF (TO TOP OF DEVICE.)
7. SINGLE ACCESS DOOR HARDWARE. RFER TO SPECIFICATION SECTION 087100 FOR ADDITIONAL INFORMATION.
8. FIRE ALARM REMOTE ANNUNCIATOR PANEL TO BE SEMI-FLUSH MOUNTED.
9. CAMERA SHALL BE INSTALLED ON MAILROOM BUILDING IF ALTERNATE #1 IS ACCEPTED. PLEASE REFER TO E-3-103 FOR ALTERNATE #1 LOCATION.
10. INSTALL DOORBELL PUSH BUTTON 48" AFF. REFER TO A-1-600 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
11. INSTALL DOORBELL CHIME 8'-0" AFF. REFER T A-1-600 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.



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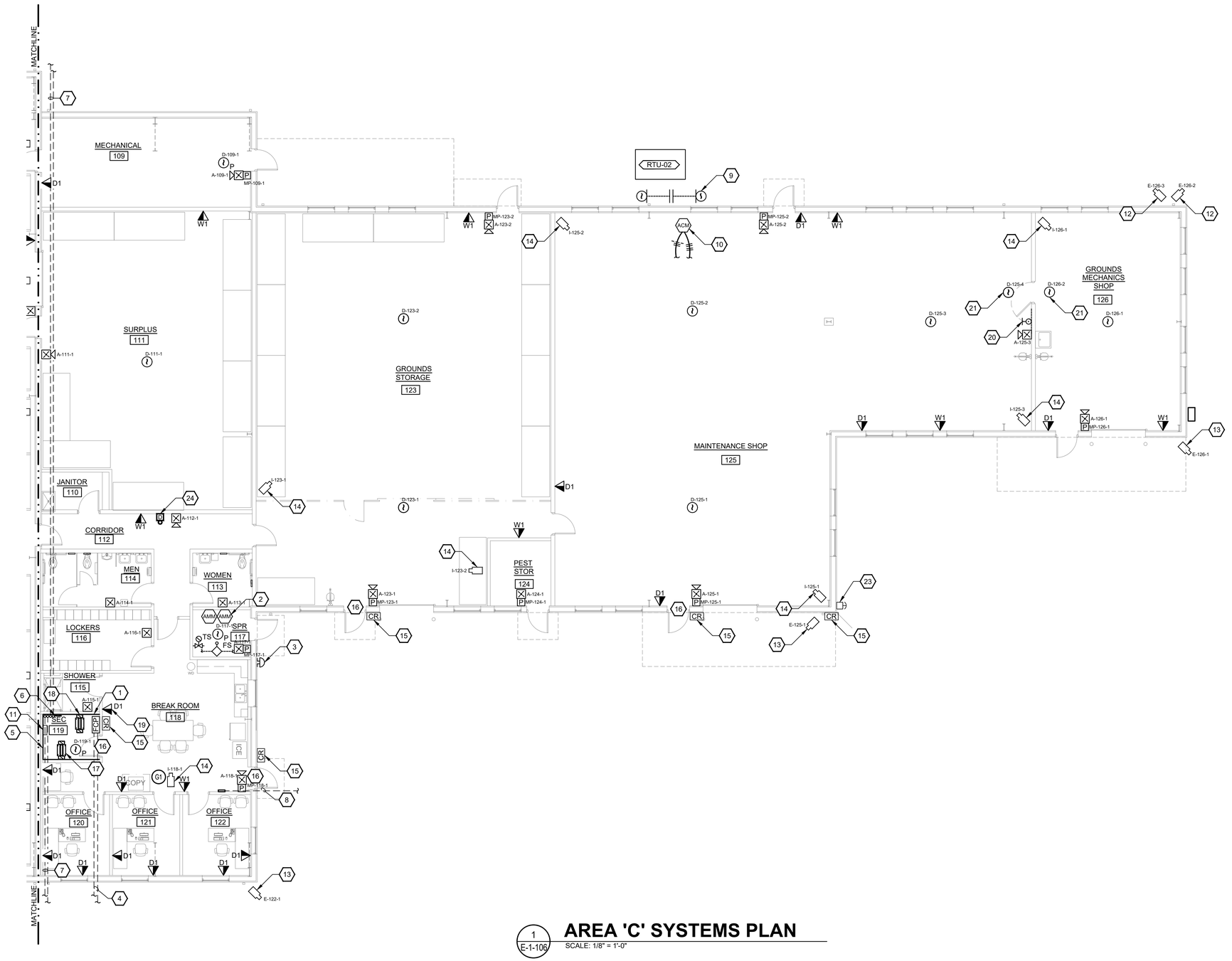
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENNANCE/SUPPORT FACILITY
WAREHOUSE AREA
AREA 'A' & 'B' SYSTEMS PLAN

PATRICK JAYE BAILEY
REGISTERED
22977
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-105	



1 E-1-106

AREA 'C' SYSTEMS PLAN

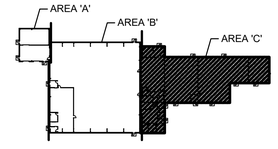
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. INSTALL 1" CONDUIT FROM EACH TELECOMMUNICATIONS OUTLET TO ABOVE CEILING. PROVIDE NYLON BUSHINGS CONDUIT CONNECTORS FOR CABLE PROTECTION.
2. REFER TO DIVISION 27 SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
3. WHERE NOTED FOR DEVICES AND/OR WIRING TO BE FURNISHED AND INSTALLED BY DOOR HARDWARE INSTALLER, THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEVICE BACKBOXES AND CONDUIT ROUGH-IN INSTALLATION.
4. REFER TO SHEET E-500 FOR ACCESS CONTROL SYSTEM / DOOR HARDWARE DETAIL.
5. REFER TO ARCHITECTURAL ELEVATIONS, SHEETS A-1-200 AND A-1-201, FOR EXTERIOR CAMERA MOUNTING HEIGHTS.
6. COORDINATE WITH DOOR HARDWARE INSTALLER FOR ALL REQUIRED ACCESS CONTROL CONNECTIONS AND ROUGH-IN REQUIREMENTS.
7. FIRE ALARM SYSTEM SHALL BE CONNECTED AS SHOWN ON THE MANUFACTURER'S SUBMITTAL DRAWINGS, WITH NUMBER OF WIRES AND CONDUIT SIZED AS REQUIRED.
8. THE FIRE ALARM SYSTEM SHALL BE MONITORED BY A U.L. APPROVED CENTRAL MONITORING STATION. THE MONITORING STATION INFORMATION AND THE CORRESPONDING U.L. FILE NUMBER SHALL BE PROVIDED TO THE PROPER APPROVAL AGENCIES BY THE SUCCESSFUL FIRE ALARM MANUFACTURER / SUPPLIER.
9. CONTRACTOR SHALL REFER TO MECHANICAL / FIRE PROTECTION DRAWINGS FOR EXACT LOCATIONS OF ALL TAMPER AND FLOW SWITCHES REQUIRED FOR THE SPRINKLER SYSTEM, INCLUDING EXTERIOR. SWITCHES SHALL BE MONITORED BY THE FIRE ALARM SYSTEM. ALL EXTERIOR FIRE ALARM LINES AHLL BE PROVIDED WITH SURGE PROTECTION.
10. ANY DUCT SMOKE DETECTORS FOR HVAC UNITS THAT ARE NOT DIRECTLY ACCESSIBLE SHALL BE PROVIDED WITH REMOTE-MOUNTED TEST SWITCHES THAT ARE MOUNTED IN AN ACCESSIBLE LOCATION AND LABELED AS TO WHICH UNIT IS MONITORED.
11. ALL FIRE ALARM INDICATING DEVICES ARE TO BE INSTALLED AT 80" OR 6" BELOW CEILING, WHICHEVER IS LOWER.
12. MANUAL PULL STATIONS ARE TO BE INSTALLED NOT LESS THAN 42" AFF OR MORE THAN 48" AFF (TO OPERATING HANDLE).
13. ALL CABLING SHALL BE INSTALLED IN CONDUIT.
14. REFER TO SHEET E-1-901 FOR FIRE ALARM SYSTEM RISER DIAGRAM.
15. ALL DATA RACKS, DATA CABLING, DATA OUTLETS, DATA JACKS, CABLE SUPPORTS, INSTALLATION AND TERMINATION SHALL BE INCLUDED IN THE PROJECT.

SHEET KEYNOTES:

1. FIRE ALARM CONTROL PANEL. PROVIDE DIGITAL DIALER WITH FIRE ALARM CONTROL PANEL. PROVIDE CAT 6A CABLE IN CONDUIT BETWEEN FIRE ALARM PANEL AND DIGITAL DIALER.
2. ADDRESSABLE FIRE ALARM MONITORING MODULES FOR FIRE PROTECTION RISER (TAMPER/FLOW SWITCHES). MODULES SHALL BE LOCATED WITHIN 3' OF DEVICE MONITORED. COORDINATE WITH FIRE PROTECTION CONTRACTOR FOR NUMBER AND LOCATIONS OF TAMPER AND FLOW SWITCHES.
3. PROVIDE CONNECTION TO FIRE PROTECTION SYSTEM WATER GONG. COORDINATE LOCATION WITH FIRE PROTECTION CONTRACTOR. PROVIDE CONDUIT/WIRING AS REQUIRED FOR CONNECTION TO FIRE ALARM CONTROL PANEL. PROVIDE 120V CONNECTION, IF REQUIRED.
4. PROVIDE 1-1/2" CONDUIT WITH FIRE CABLING TO FIRE PROTECTION VAULT, REFER TO LOCATION SHOWN ON C-0-107.
5. CONTRACTOR SHALL WRAP COMMUNICATIONS ROOM WITH 3/4" X 4' X 8' PLYWOOD, RIGIDLY ATTACHED TO WALL MOUNT VERTICALLY WITH TOP OF PLYWOOD AT 8'-0"AFF. PLYWOOD SHALL BE FIRE RATED AND TIA/EIA APPROVED.
6. TELECOMMUNICATIONS MAIN GROUNDING BUSBAR. (TMGB) - 1/4" X 4" X 16" (MIN) GROUND BAR. MOUNT TO WALL WITH NON-CONDUCTIVE MATERIAL.
7. COMMUNICATION SERVICE CONDUITS. PROVIDE TWO (2) 2" CONDUITS WITH PULL STRING. STUB UP INTO SECURITY ROOM 119 WITH LONG SWEEP RIGID STEEL ELBOWS. REFER TO SHEET C-0-107 FOR CONTINUATION.
8. FUEL TANK SIGNAL/CONTROL CONDUITS. PROVIDE TWO (2) 2" CONDUITS FROM BREAKROOM TO FUEL TANKS. REFER TO C-0-107 FOR CONTINUATION.
9. PROVIDE DUCT SMOKE DETECTOR WITH WEATHERPROOF ENCLOSURE. INSTALL IN AIR DUCT FOR RTU. COORDINATE QUANTITIES AND PLACEMENT WITH LOCAL CODE REQUIREMENTS.
10. ADDRESSABLE FIRE ALARM CONTROL MODULE FOR DUCT SMOKE DETECTOR. PROVIDE FIRE ALARM SIGNALING LINE CIRCUIT (SLC WIRING) TO FIRE ALARM CONTROL PANEL. PROVIDE CONDUIT/WIRING TO HVAC UNIT CONTROLS FOR UNIT SHUTDOWN UPON ACTIVATION OF ASSOCIATED DUCT SMOKE DETECTOR. COORDINATE LOCATION WITH MECHANICAL CONTRACTOR.
11. ACCESS CONTROL SYSTEM PANEL
12. PROTECTIVE SERVICES CAMERA. PROVIDE EXTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-902 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.
13. GSD AGENCY CAMERA. PROVIDE EXTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-903 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.
14. GSD AGENCY CAMERA. PROVIDE INTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-903 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.
15. CARD READER. MOUNT AT 42" AFF (TO TOP OF DEVICE.)
16. SINGLE ACCESS DOOR HARDWARE. RFER TO SPECIFICATION SECTION 087100 FOR ADDITIONAL INFORMATION.
17. EQUIPMENT RACK FOR INTEGRATED SECURITY MANAGEMENT SYSTEM.
18. EQUIPMENT RACK LOCATION FOR BUILDING DATA SYSTEM.
19. DATA LOCATION FOR TIME CLOCK.
20. MAGNETIC DOOR HOLD OPEN.
21. SMOKE DETECTOR FOR DOOR RELEASE. SMOKE DETECTOR SHALL BE LOCATED WITHIN 5'-0" OF DOORWAY.
22. COMMUNICATION SERVICE CONDUITS. PROVIDE TWO (2) 4" CONDUITS. STUB UP INTO SECURITY ROOM 119 WITH LONG SWEEP RIGID STEEL ELBOWS. REFER TO SHEET C-0-107 FOR CONTINUATION.
23. PUSH TO EXIT FOR EXTERIOR GATE.
24. INSTALL DOORBELL CHIME 8'-0" AFF. REFER T A-1-600 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.



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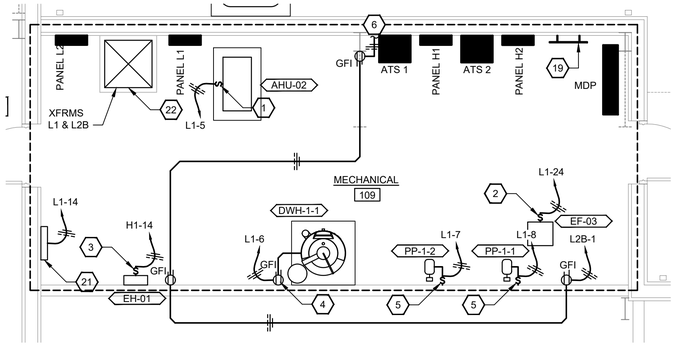
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GSD MAINTENANCE/SUPPORT FACILITY
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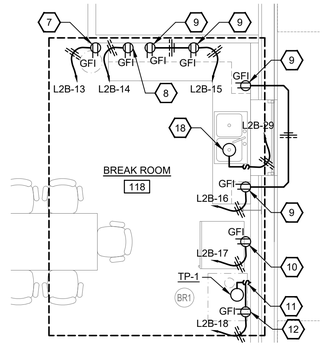
PATRICK JAYE BAILEY
REGISTERED
22277
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-106	



1 E-1-400 ENLARGED MECHANICAL ROOM POWER PLAN

SCALE: 1/4" = 1'-0"

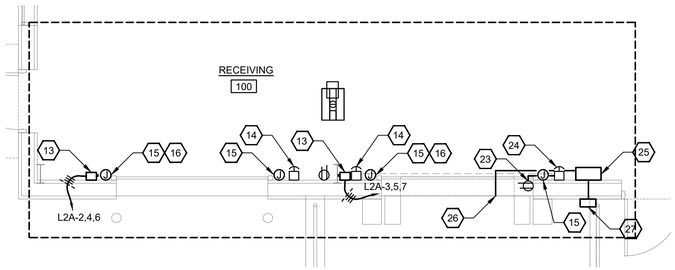


2 E-1-400 ENLARGED BREAKROOM POWER PLAN

SCALE: 1/4" = 1'-0"

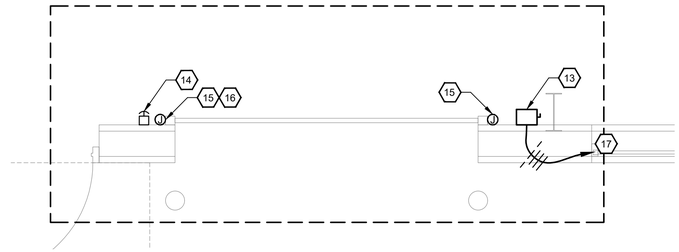
EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
BR1	ICE MACHINE



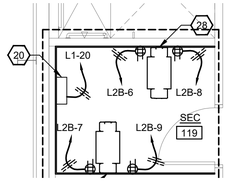
3 E-1-400 ENLARGED DOCK POWER PLAN

SCALE: 1/4" = 1'-0"



4 E-1-400 TYPICAL OVERHEAD DOOR POWER PLAN

SCALE: 1/2" = 1'-0"



5 E-1-400 ENLARGED SECURITY ROOM POWER PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

⬡ SHEET KEYNOTES:

1. PROVIDE 15A SINGLE POLE TOGGLE SWITCH DISCONNECT FOR AHU.
2. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWITCH FURNISHED WITH EXHAUST FAN.
3. PROVIDE ELECTRICAL CONNECTION TO INTEGRAL DISCONNECT IN ELECTRIC UNIT HEATER.
4. PROVIDE ELECTRICAL CONNECTION FOR GAS FIRED WATER HEATER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
5. PROVIDE ELECTRICAL CONNECTION FOR RECIRULATING PUMP. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
6. REFER TO SHEET E-1-104 FOR CONTINUATION.
7. PROVIDE NEMA 5-20 RECEPTACLE FOR WATER DISPENSER.
8. PROVIDE RECEPTACLE 60" AFF FOR MICROWAVE. COORDINATE EXACT LOCATION WITH CASEWORK.
9. PROVIDE RECEPTACLE 48" AFF. COORDINATE EXACT LOCATION WITH CASEWORK.
10. PROVIDE RECEPTACLE FOR REFRIGERATOR.
11. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS
12. PROVIDE NEMA 5-20 RECEPTACLE FOR ICE MAKER.
13. MOTOR RATED SWITCH FOR OVERHEAD DOOR. COORDINATE MOUNTING LOCATION WITH ARCHITECTURAL.
14. UP/DOWN/STOP PUSHBUTTON FOR OVERHEAD DOOR. PROVIDE CONDUIT/WIRING AS REQUIRED TO OVERHEAD DOOR CONTROLLER.
15. CONNECTION TO OVERHEAD DOOR SAFETY BEAM PHOTO SENSOR. PROVIDE CONDUIT/WIRING AS REQUIRED TO OVERHEAD DOOR CONTROLLER.
16. CONNECTION TO OVERHEAD DOOR SENSING EDGE. PROVIDE CONDUIT/WIRING AS REQUIRED TO OVERHEAD DOOR CONTROLLER.
17. OVERHEAD DOOR CIRCUITS:
    ROOM 123: L2C-1,3,5
    ROOM 125: L2C-16,18,20
    ROOM 126: L2D-1,3,5
18. UNDER SINK DISPOSER. PROVIDE WALL SWITCH AND ASSOCIATED WIRING FOR CONTROL OF DISPOSER. COORDINATE LOCATION WITH ARCHITECTURAL CASEWORK.
19. MAIN GROUNDING BAR.
20. PROVIDE 120V CONNECTION TO ACCESS CONTROL PANEL.
21. PROVIDE 120V CONNECTION TO HVAC DDC CONTROL PANEL.
22. PROVIDE SUPPORTS TO STACK TRANSFORMERS.
23. PROVIDE RECEPTACLE FOR DOCK LEVELER. CONNECT TO CIRCUIT L2A-8. PROVIDE 3/4" CONDUIT FROM RECEPTACLE TO WALL MOUNTED PUSH BUTTON.
24. INSTALL PUSH BUTTON FOR DOCK LEVELER 48" AFF.
25. INSTALL CONTROL PANEL FOR VEHICLE RESTRAINT SYSTEM. CONNECT TO CIRCUIT L2A-29. PROVIDE 3/4" CONDUITS TO LIP LIMIT SWITCH AND TRUCK SIGNAL LIGHT.
26. LIP LIMIT SWITCH.
27. TRUCK SIGNAL LIGHT.
28. REFER TO SYSTEMS PLANS E-1-106 FOR DATA RACK REQUIREMENTS.

0' 2' 4' 8' 12'

SCALE: 1" = 4'

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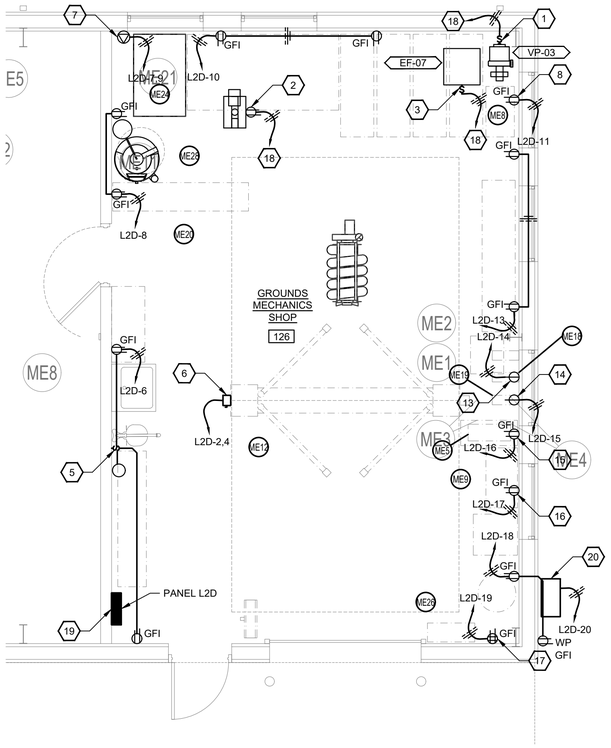
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
WAREHOUSE / GROUNDS
ENLARGED POWER PLANS

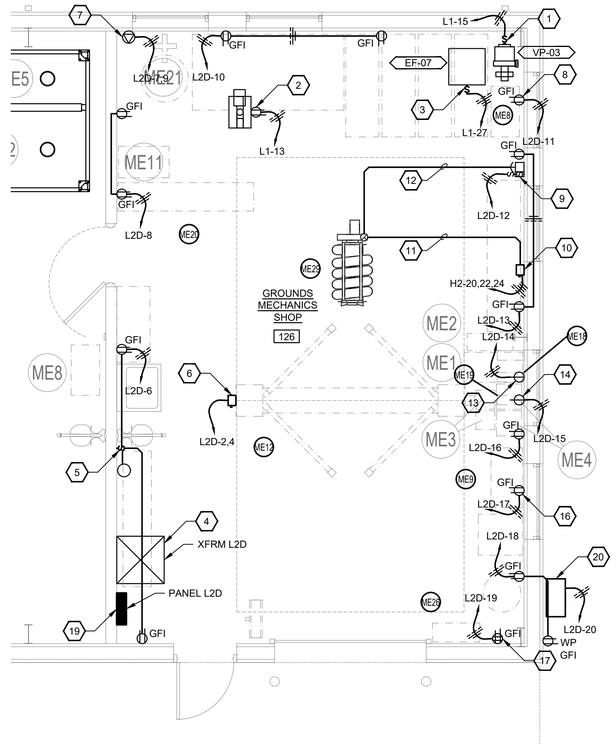
PATRICK JAYE BAILEY
REGISTERED
22177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-400	△



1 E-1-401 ENLARGED GND MECH SHOP POWER PLAN - PHASE 1A

SCALE: 1/4" = 1'-0"



2 E-1-401 ENLARGED GND MECH SHOP POWER PLAN - FINAL

SCALE: 1/4" = 1'-0"

EQUIPMENT SCHEDULE	
ITEM	DESCRIPTION
ME5	MIG WELDER
ME8	DRILL PRESS
ME9	20G PARTS WASH
ME12	GOLF CART LIFT
ME18	POWER REEL
ME19	WORK LIGHT REEL
ME20	TALL WORKBENCH
ME21	TIRE CHANGER
ME24	AIR COMPRESSOR
ME26	PEDISTAL TOOLS
ME28	WATER HEATER
ME29	VEHICLE EXHAUST FAN

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-1-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.
7. COORDINATE EXACT CONNECTION REQUIREMENTS FOR ALL OWNER PROVIDED EQUIPMENT.

⬡ SHEET KEYNOTES:

1. PROVIDE 15A SINGLE POLE TOGGLE SWTICH DISCONNECT FOR RADIANT HEATING PUMP.
2. PROVIDE NEMA 5-15 RECEPTACLE FOR RADIANT HEATING BURNER. MOUNT WITHIN 12" OF BURNER UNIT.
3. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWTICH FURNISHED WITH EXHAUST FAN.
4. PROVIDE MOUNTING BRACKET FOR TRANSFORMER. MOUNT TOP OF TRANSFORMER AS CLOSE TO BOTTOM OF STRUCTURE AS POSSIBLE.
5. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
6. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT FURNISHED WITH VEHICLE LIFT.
7. PROVIDE RECEPTACLE FOR AIR COMPRESSOR. PROVIDE AND INSTALL CORD & PLUG FOR OWNER PROVIDED AIR COMPRESSOR.
8. PROVIDE NEMA 5-20 RECEPTACLE FOR DRILL PRESS.
9. LOCATION OF VES FAN START/STOP SWITCH AND HOSE REEL UP/DOWN SWITCH. VES FAN START/STOP SWITCH REQUIRES CONTROL WIRING TO FAN CONTROLLER. HOSE REEL UP/DOWN SWITCH REQUIRES 120V CONNECTION VIA 120V DISCONNECT SWITCH AND POWER/CONTROL TO HOSE REEL.
10. PROVIDE A NEMA 1, 30A NON FUSED DISCONNECT. PROVIDE CONNECTION TO VEHICULAR EXHAUST FAN MOTOR. MOUNT DISCONNECT AND CONTROLLER AT 7'-6" AFF.
11. PROVIDE CONDUIT/WIRING FROM VEHICULAR EXHAUST FAN CONTROLLER TO FAN START/STOP SWITCH.
12. PROVIDE CONDUIT/WIRING FROM HOSE REEL TO UP/DOWN SWITCH.
13. PROVIDE NEMA 5-20 RECEPTACLE 12'-0" AFF FOR OWNER PROVIDED RECEPTACLE CORD REEL.
14. PROVIDE NEMA 5-20 RECEPTACLE 12'-0" AFF FOR OWNER PROVIDED LIGHT CORD REEL.
15. PROVIDE NEMA 5-20 RECEPTACLE FOR WELDER.
16. PROVIDE NEMA 5-20 RECEPTACLE FOR PARTS WASH.
17. PROVIDE NEMA 5-20 RECEPTACLES FOR POWER TOOLS.
18. CIRCUIT SHALL TEMPORARILY BE CONNECTED TO PANEL L2D DURING PHASE 1.
19. PANEL L2D SHALL BE SERVICE ENTRANCE RATED AND TEMPORARILY FED FROM SERVICE DROP POLE DURING PHASE 1. PANEL SHALL BE CONNECTED TO BUILDING SERVICE AFTER THE PHASE 2 BUILDING SERVICE IS OPERATIONAL.
20. OIL WATER SEPARATOR ALARM PANEL.

0' 2' 4' 8' 12'

SCALE: 1" = 4'

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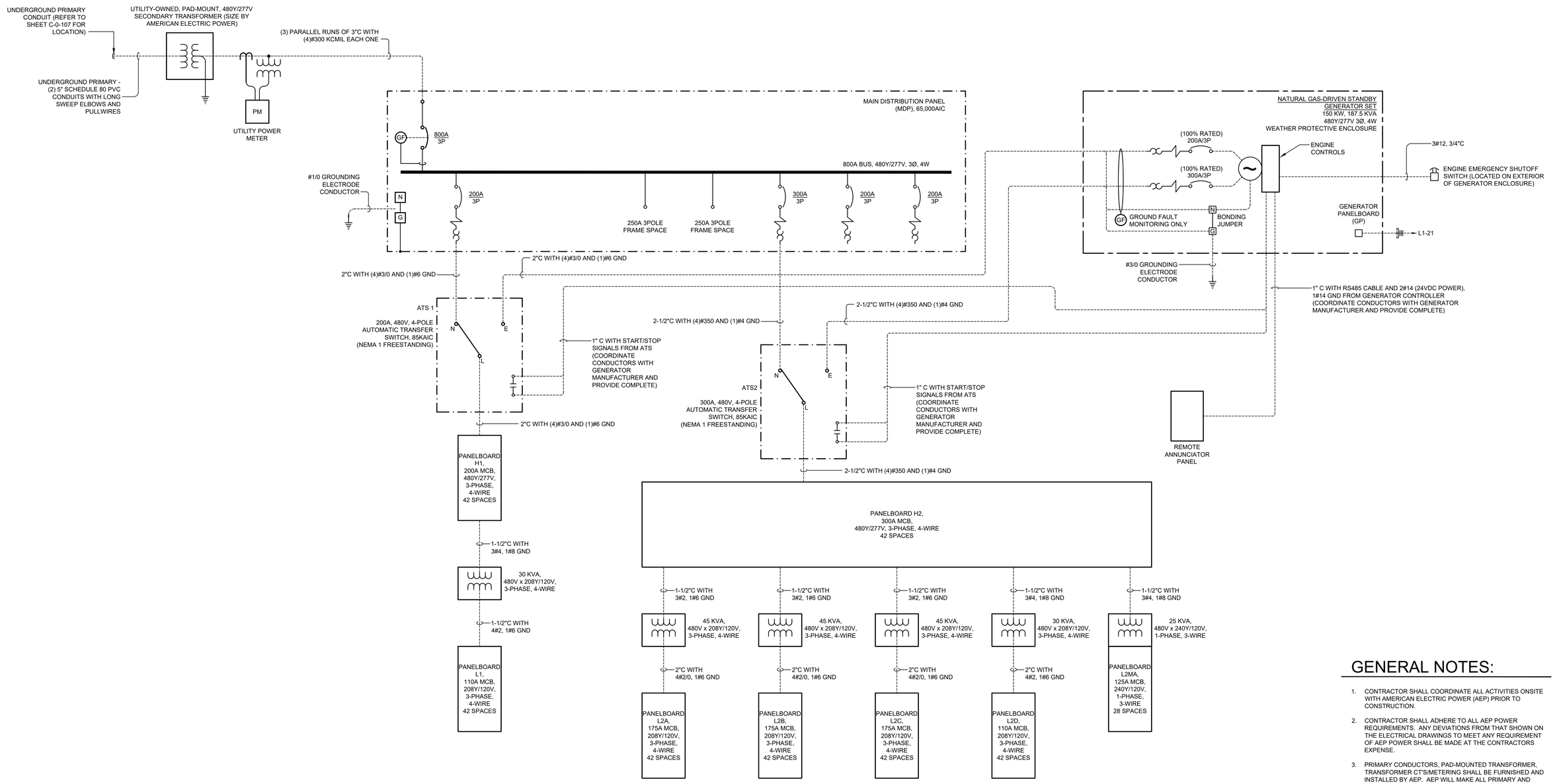
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

GSD MAINTENANCE/SUPPORT FACILITY
GROUNDS MECHANICS SHOP
ENLARGED POWER PLAN

PATRICK JAYE BAILEY
REGISTERED
22177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	E-1-401
REVISION	△



1 WAREHOUSE / GROUNDS ELECTRIC RISER

NOT TO SCALE

GENERAL NOTES:

1. CONTRACTOR SHALL COORDINATE ALL ACTIVITIES ONSITE WITH AMERICAN ELECTRIC POWER (AEP) PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL ADHERE TO ALL AEP POWER REQUIREMENTS. ANY DEVIATIONS FROM THAT SHOWN ON THE ELECTRICAL DRAWINGS TO MEET ANY REQUIREMENT OF AEP POWER SHALL BE MADE AT THE CONTRACTORS EXPENSE.
3. PRIMARY CONDUCTORS, PAD-MOUNTED TRANSFORMER, TRANSFORMER CT'S/METERING SHALL BE FURNISHED AND INSTALLED BY AEP. AEP WILL MAKE ALL PRIMARY AND SECONDARY TERMINATIONS AT THE TRANSFORMER.
4. PRIMARY CONDUITS W/PULLWIRES, SECONDARY CONDUITS AND CONDUCTORS, TRANSFORMER PAD, AND ALL TRENCHING/BACKFILL SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
5. CONTRACTOR SHALL VERIFY ALL REQUIRED INTERCONNECTION BETWEEN ATS AND GENSET PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE ALL REQUIRED CABLING AS PART OF THE PROJECT.
6. SURGE PROTECTION DEVICES SHALL MEET UL REQUIREMENTS FOR MASTER LABELLED LIGHTNING PROTECTION SYSTEM.

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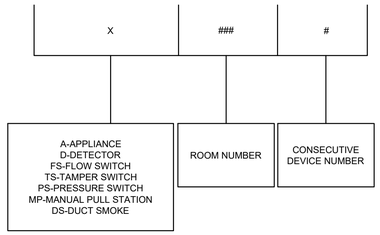
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL DIAGRAMS
WAREHOUSE / GROUNDS
ELECTRICAL RISER

PATRICK JAYE BAILEY REGISTERED STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 022777 8-6-21

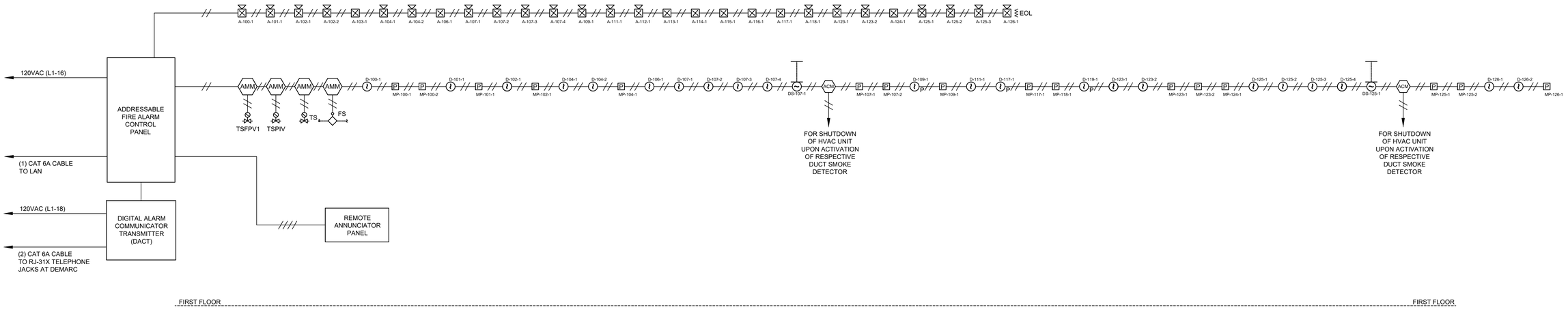
JOB NUMBER:	19027
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DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-900	△



FIRE ALARM ADDRESS DESIGNATIONS

NOTES:

1. REFER TO SPECIFICATION SECTION 283100 FIRE ALARM FOR ADDITIONAL INFORMATION.
2. ACTUAL WIRING CONFIGURATION AND TYPE/SIZE OF CONDUCTORS SHALL BE AS RECOMMENDED BY THE FIRE ALARM MANUFACTURER WITHIN MINIMUM REQUIREMENTS STATED IN SPECIFICATIONS.
3. PROVIDE ALL NECESSARY PROGRAMMING, MODULES, ACCESSORIES, ETC., AS REQUIRED TO ACHIEVE CORRECT OPERATION.
4. PROVIDE SURGE SUPPRESSION FOR ALL EXTERIOR CIRCUITS.
5. CANDELA RATINGS OF ALL VISUAL NOTIFICATION APPLIANCES SHALL BE AS DETERMINED BY FIRE ALARM MANUFACTURER WITHIN MINIMUM REQUIREMENTS STATED IN SPECIFICATIONS.



1 WAREHOUSE / GROUNDS FIRE ALARM RISER DIAGRAM

NOT TO SCALE

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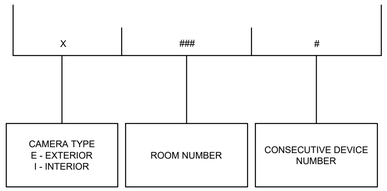
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West Virginia Department of Administration
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Charleston, West Virginia

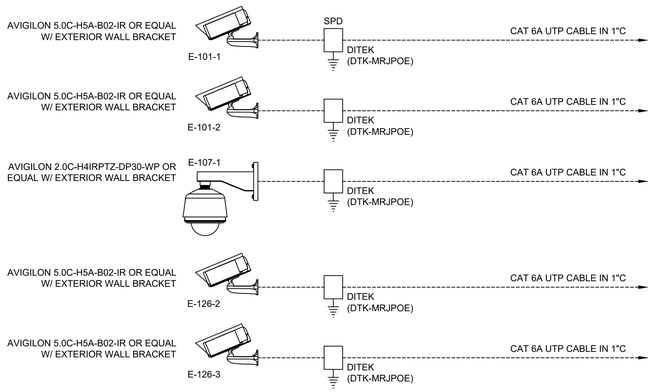
ELECTRICAL DIAGRAMS
WAREHOUSE / GROUNDS
FIRE ALARM RISER

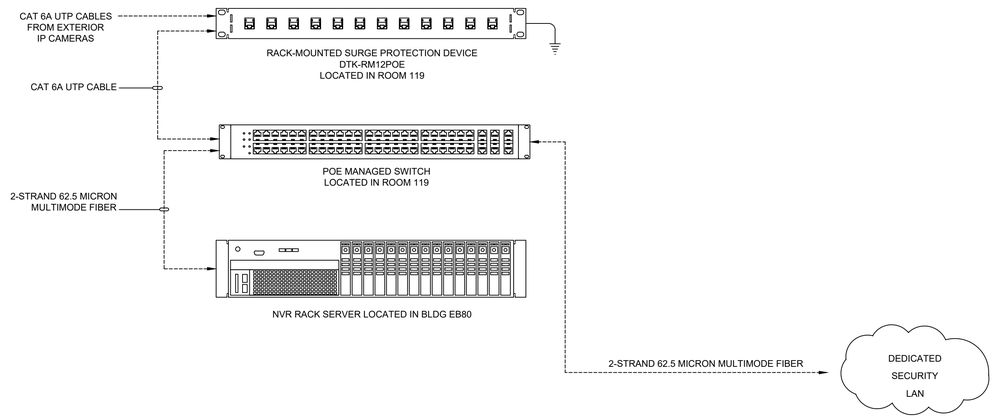
PATRICK JAYE BALL
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STATE OF
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PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-901	△



SECURITY CAMERA SYSTEM ADDRESS DESIGNATIONS





1 SECURITY CAMERA SYSTEM RISER DIAGRAM

NOT TO SCALE

NOTES:

1. REFER TO SPECIFICATION SECTION 287890 INTEGRATED SECURITY MANAGEMENT SYSTEM FOR ADDITIONAL INFORMATION.
2. ACTUAL WIRING CONFIGURATION AND TYPE/SIZE OF CONDUCTORS SHALL BE AS RECOMMENDED BY THE SECURITY CAMERA SYSTEM MANUFACTURER/ SUPPLIER WITHIN MINIMUM REQUIREMENTS STATED IN SPECIFICATIONS.
3. PROVIDE ALL NECESSARY PROGRAMMING, MODULES, ACCESSORIES, ETC., AS REQUIRED TO ACHIEVE CORRECT OPERATION.
4. PROVIDE SURGE SUPPRESSION FOR ALL EXTERIOR CIRCUITS.

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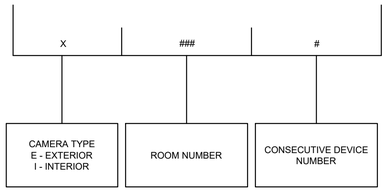
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PROJECT INFORMATION
West Virginia Department of Administration
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ELECTRICAL DIAGRAMS
PROTECTIVE SERVICES
SECURITY CAMERA SYSTEM RISER

PATRICK JAYE BALL
REGISTERED
22177
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

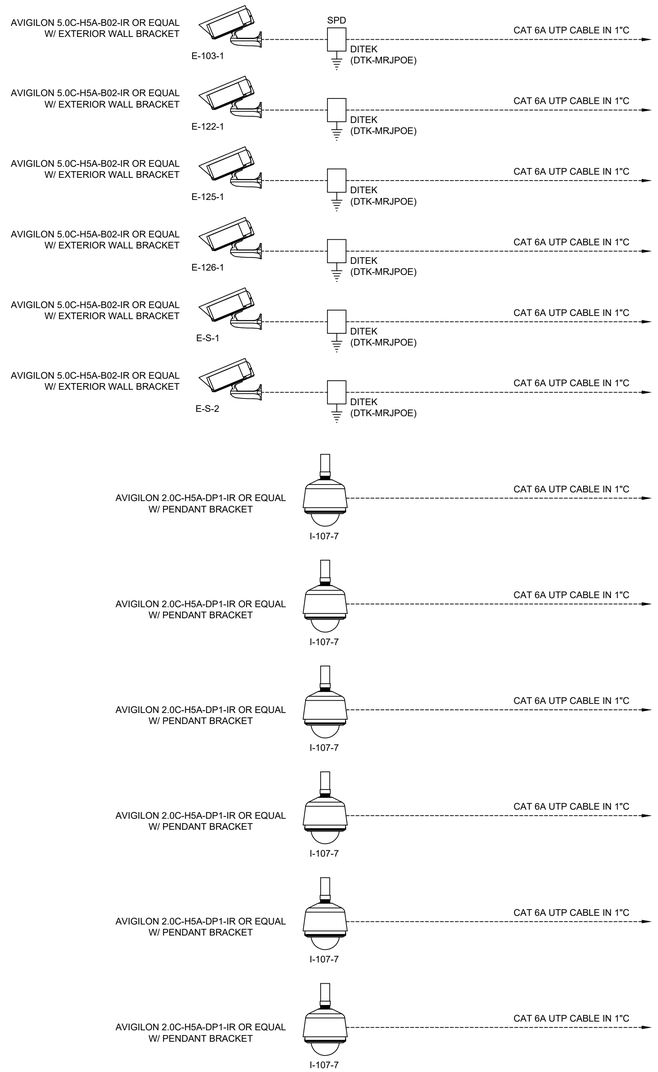
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SHEET NO.	REVISION
E-1-902	△

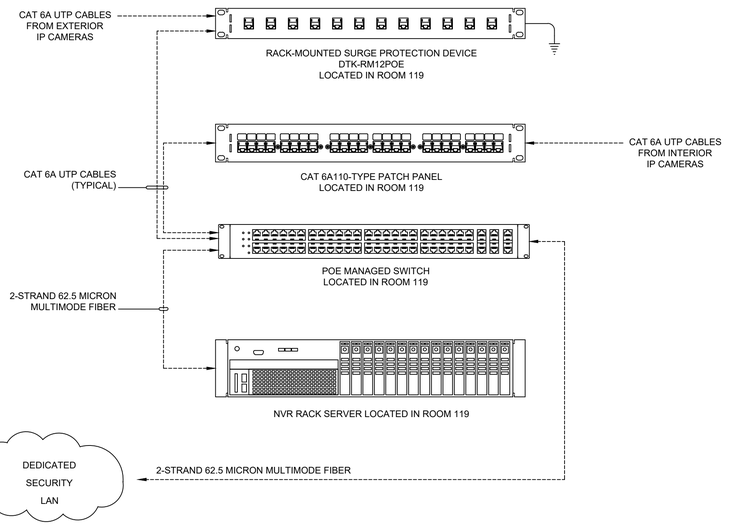


SECURITY CAMERA SYSTEM ADDRESS DESIGNATIONS

NOTES:

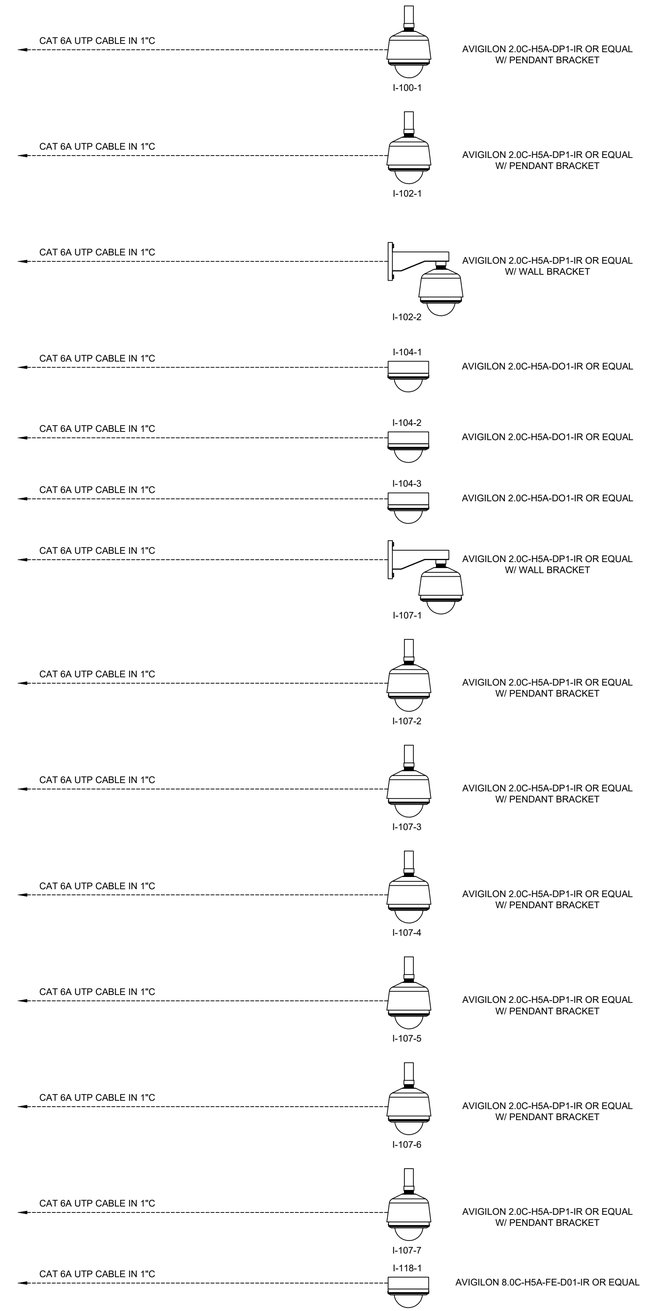
1. REFER TO SPECIFICATION SECTION 287890 INTEGRATED SECURITY MANAGEMENT SYSTEM FOR ADDITIONAL INFORMATION.
2. ACTUAL WIRING CONFIGURATION AND TYPE/SIZE OF CONDUCTORS SHALL BE AS RECOMMENDED BY THE SECURITY CAMERA SYSTEM MANUFACTURER/ SUPPLIER WITHIN MINIMUM REQUIREMENTS STATED IN SPECIFICATIONS.
3. PROVIDE ALL NECESSARY PROGRAMMING, MODULES, ACCESSORIES, ETC., AS REQUIRED TO ACHIEVE CORRECT OPERATION.
4. PROVIDE SURGE SUPPRESSION FOR ALL EXTERIOR CIRCUITS.





1 SECURITY CAMERA SYSTEM RISER DIAGRAM

NOT TO SCALE



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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL DIAGRAMS
GSD AGENCY
SECURITY CAMERA SYSTEM RISER

PATRICK JAYE BAILEY
REGISTERED
22277
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8-6-21

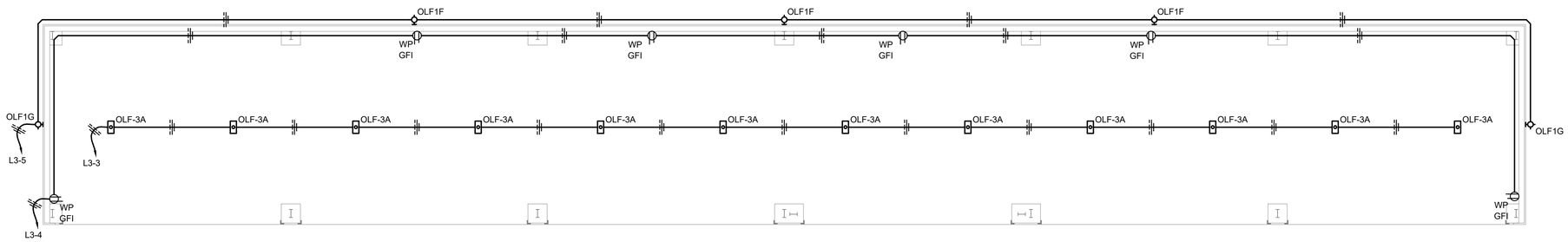
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CHECKED BY:	PJB
SHEET NO.	REVISION
E-1-903	

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-900 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
3. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

⬡ SHEET KEYNOTES:

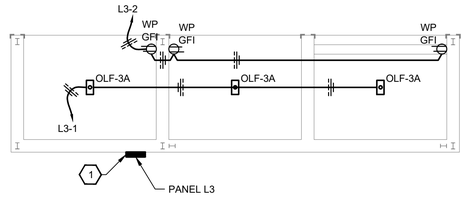
1. PANEL, IN NEMA 3R ENCLOSURE, SHALL BE MOUNTED ON GROUND MOUNTED FREE STANDING SUPPORT RACK AT BULK STORAGE BUILDING.



1 E-2-100

OPEN STORAGE ELECTRICAL PLAN

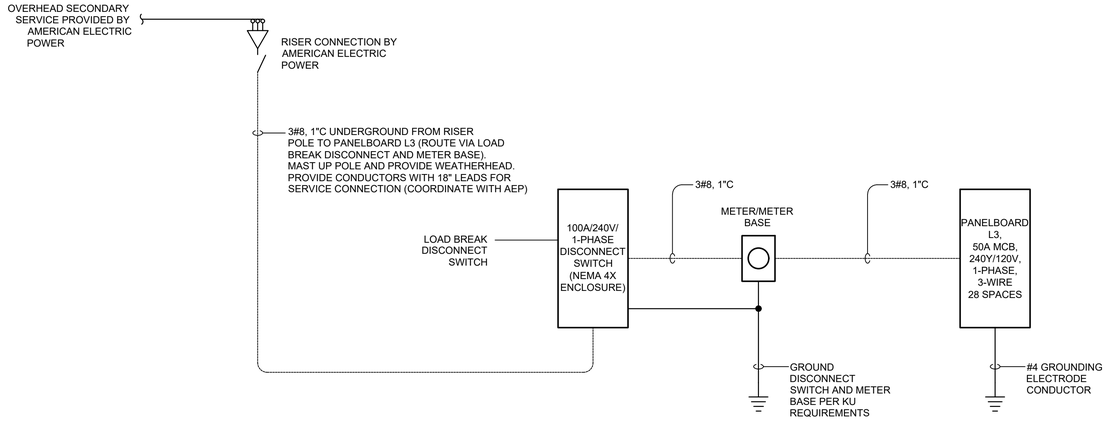
SCALE: 1/8" = 1'-0"



2 E-2-100

BULK STORAGE ELECTRICAL PLAN

SCALE: 1/8" = 1'-0"



ELECTRIC RISER NOTES:

1. CONTRACTOR SHALL COORDINATE ALL ACTIVITIES ONSITE WITH AMERICAN ELECTRIC POWER (AEP) PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL ADHERE TO ALL AEP POWER REQUIREMENTS. ANY DEVIATIONS FROM THAT SHOWN ON THE ELECTRICAL DRAWINGS TO MEET ANY REQUIREMENT OF AEP POWER SHALL BE MADE AT THE CONTRACTORS EXPENSE.
3. PRIMARY CONDUCTORS, PAD-MOUNTED TRANSFORMER, TRANSFORMER CT'S/METERING SHALL BE FURNISHED AND INSTALLED BY AEP. AEP WILL MAKE ALL PRIMARY AND SECONDARY TERMINATIONS AT THE TRANSFORMER.
4. PRIMARY CONDUITS W/PULLWIRES, SECONDARY CONDUITS AND CONDUCTORS, TRANSFORMER PAD, AND ALL TRENCHING/BACKFILL SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
5. CONTRACTOR SHALL VERIFY ALL REQUIRED INTERCONNECTION BETWEEN ATS AND GENSET PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE ALL REQUIRED CABLING AS PART OF THE PROJECT.
6. SURGE PROTECTION DEVICES SHALL MEET UL REQUIREMENTS FOR MASTER LABELLED LIGHTNING PROTECTION SYSTEM.

1

BULK STORAGE BLDG ELECTRIC RISER

NOT TO SCALE

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PROJECT INFORMATION
West Virginia Department of Administration
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Capitol East Campus
Charleston, West Virginia

OPEN STORAGE AND BULK STORAGE ELECTRICAL PLAN

PATRICK JAYE BALL — REGISTERED — 022777 — STATE OF WEST VIRGINIA — PROFESSIONAL ENGINEER — 8-6-21

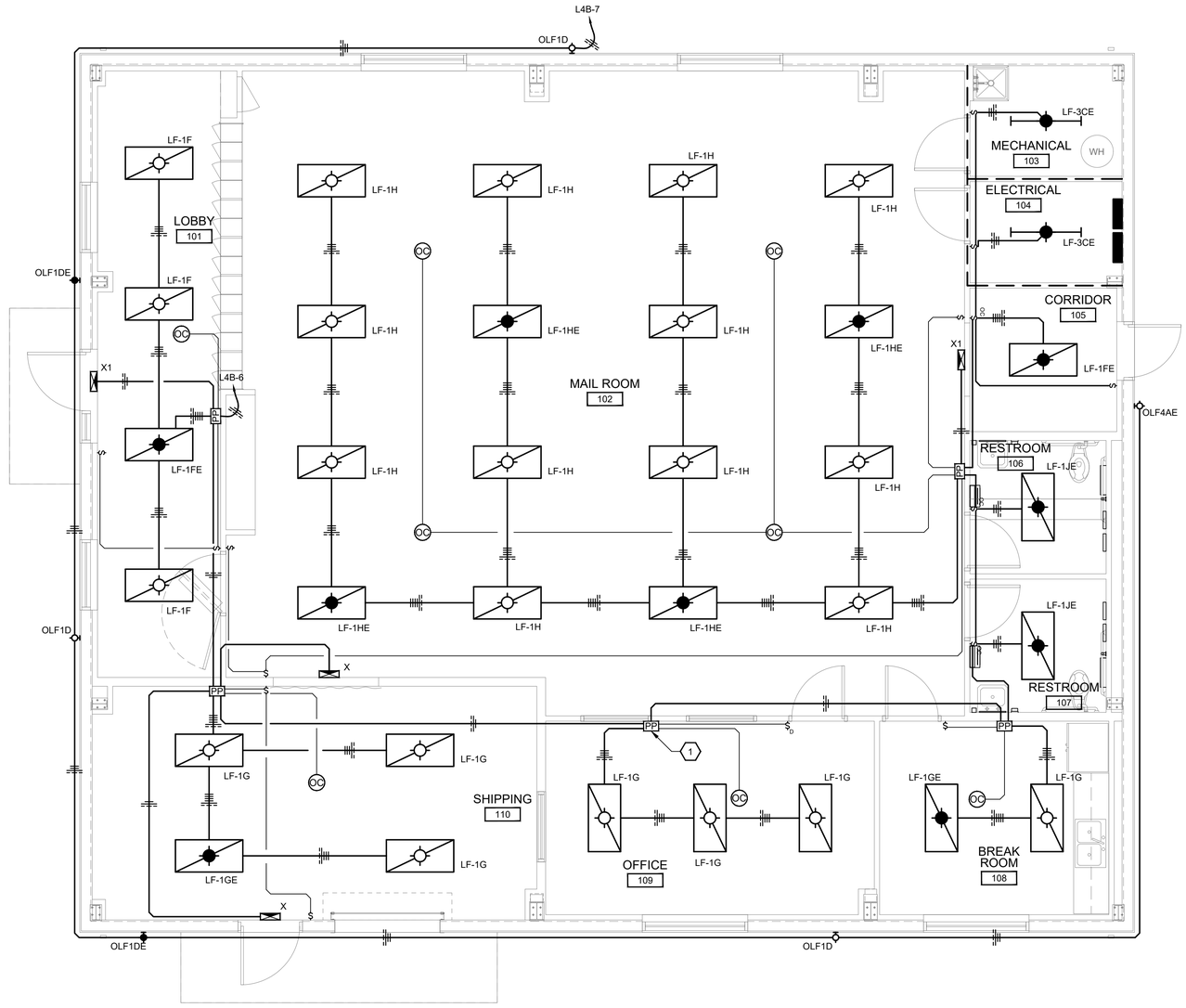
JOB NUMBER:	19027
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DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-2-100	△

GENERAL NOTES:

1. REFER TO POWER PLANS FOR PANELBOARD LOCATIONS.
2. REFER TO SPECIFICATION SECTION 260548 FOR MOUNTING/SUPPORT REQUIREMENTS FOR LUMINAIRES.
3. OCCUPANCY SENSORS SHALL BE MOUNTED ON A VIBRATION FREE SURFACE AND SHALL BE LOCATED AT LEAST 6'-0" FROM DIFFUSERS. DO NOT MOUNT SENSORS CLOSER THAN 10'-0" FROM EACH OTHER.
4. PROVIDE AN UNSWITCHED LIGHTING CIRCUIT (NORMAL POWER) TO EACH LUMINAIRE CONTAINING AN EMERGENCY BATTERY DRIVER.
5. 0-10VDC DIMMING CONDUCTORS (CLASS 2) SHALL BE ROUTED IN SEPARATE CONDUIT FROM THE POWER CONDUCTORS.
6. LIGHTING CONTROL CABLE SHALL BE "DAISY CHAINED" BETWEEN LIGHTING CONTROL DEVICES (OCCUPANCY SENSOR, POWER/RELAY PACKS, WALL PODS, ETC.) WITHIN EACH ROOM AS SHOWN. CABLING SHALL BE ROUTED ABOVE CEILING AND SECURED WITH BRIDLE RINGS OR OTHER SIMILAR WIRE METHODS.

⬡ SHEET KEYNOTES:

1. REFER TO POWER PLANS AND DETAILS FOR INTERCONNECTION TO RECEPTACLE CONTROL IN THIS AREA.



1 ELECTRICAL LIGHTING PLAN
E-3-101

SCALE: 1/4" = 1'-0"

REVISION NUMBER	REVISIONS	DATE	BY

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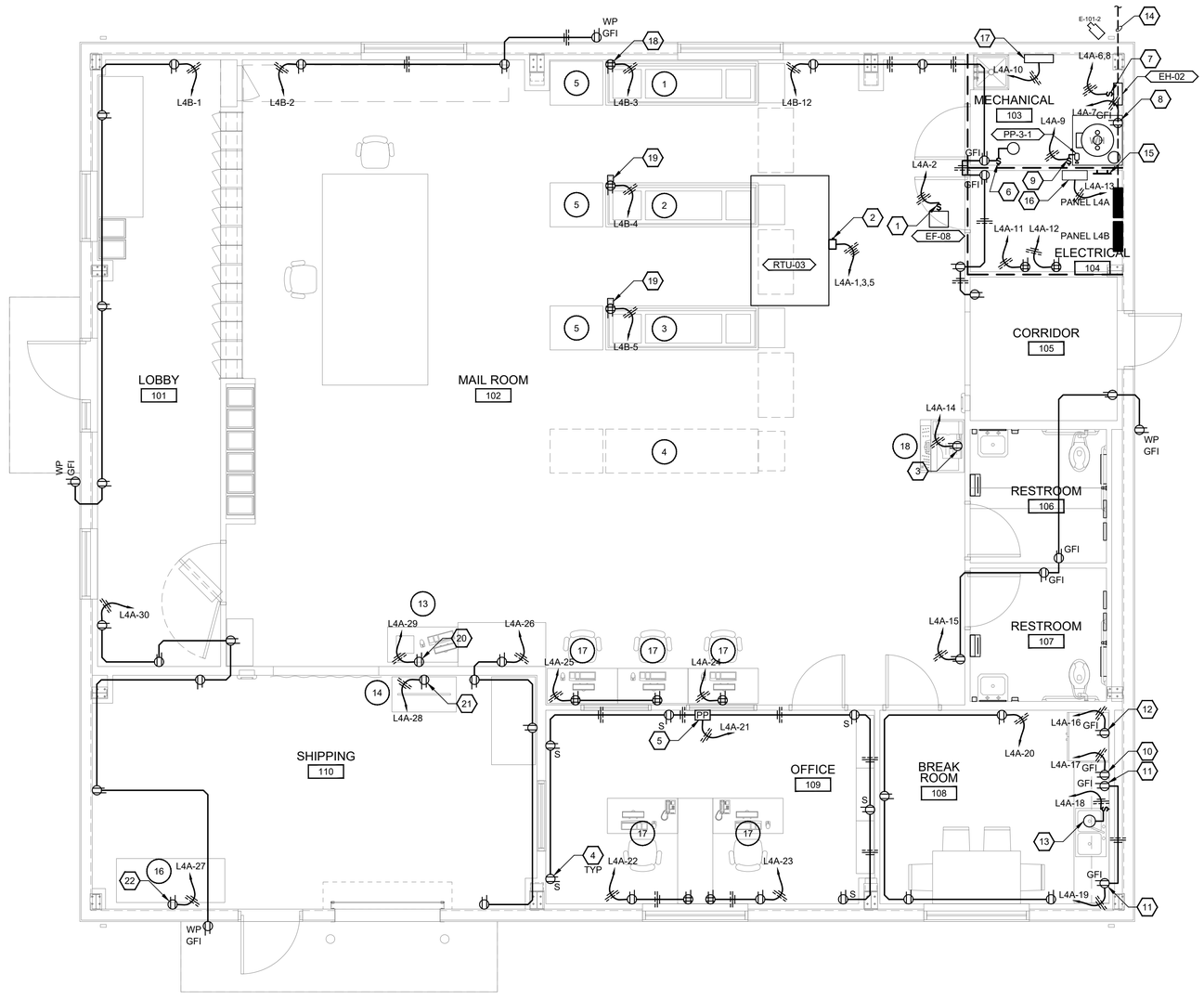
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1
ELECTRICAL LIGHTING PLAN

PATRICK JAYE BALL
REGISTERED
22177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
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E-3-101	△



1 E-3-102

ELECTRICAL POWER PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. REFER TO ONE-LINE DIAGRAM ON SHEET E-601 FOR CONDUIT/CONDUCTOR SIZES FOR EQUIPMENT/PANELBOARD FEEDERS.
2. COORDINATE EXACT LOCATION OF PANELBOARDS AND OTHER ELECTRICAL EQUIPMENT WITH HVAC AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
3. COORDINATE EXACT LOCATION OF RECEPTACLES, EQUIPMENT CONNECTIONS, DEVICES, ETC. WITH ARCHITECT APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN.
4. COORDINATE EXACT EQUIPMENT REQUIREMENTS OF HVAC AND PLUMBING EQUIPMENT WITH ALL ENGINEER APPROVED SHOP DRAWINGS AND MECHANICAL/PLUMBING CONTRACTORS PRIOR TO ROUGH-IN.
5. PROVIDE FIRE STOP FOR PENETRATIONS OF FIRE RATED WALLS AND FLOORS. REFER TO ARCHITECTURAL DRAWINGS.
6. INDIVIDUAL HOMERUNS HAVE BEEN SHOWN FOR EACH CIRCUIT FOR CLARITY. CONTRACTOR MAY CHOOSE TO COMBINE UP TO (3) 20A/120V BRANCH CIRCUITS INTO A COMMON CONDUIT WITHOUT UPSIZING CONDUCTORS. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR WITH UNIQUE COLOR-CODED IDENTIFIER MATCHING THE RESPECTIVE PHASE CONDUCTOR IN EACH CONDUIT.

⬡ SHEET KEYNOTES:

1. PROVIDE ELECTRICAL CONNECTION TO DISCONNECT SWTICH FURNISHED WITH EXHAUST FAN.
2. PROVIDE NEMA 3R 60 AMP NON FUSED SAFETY SWITCH FOR RTU.
3. PROVIDE NEMA 5-20 RECEPTACLE FOR COPIER.
4. OCCUPANCY CONTROLLED RECEPTACLE. PROVIDE LABEL ON FACEPLATE. "RECEPTACLE CONTROLLED BY OCCUPANCY SENSOR."
5. RECEPTACLE CONTROL POWER PACK. REFER TO LIGHTING PLANS AND DETAILS FOR INTERCONNECTION TO LIGHTING CONTROL IN THIS AREA.
6. PROVIDE ELECTRICAL CONNECTION FOR TRAP PRIMER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
7. PROVIDE ELECTRICAL CONNECTION TO INTEGRAL DISCONNECT IN ELECTRIC UNIT HEATER.
8. PROVIDE ELECTRICAL CONNECTION FOR GAS FIRED WATER HEATER. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.
9. PROVIDE ELECTRICAL CONNECTION FOR RECIRULATING PUMP. COORDINATE EXACT MEANS OF DISCONNECT REQUIRED FOR EQUIPMENT WITH SHOP DRAWINGS.PROVIDE DISCONNECT FOR GAS FIRED WATER HEATER.
10. PROVIDE RECEPTACLE 60" AFF FOR MICROWAVE. COORDINATE EXACT LOCATION WITH CASEWORK.
11. PROVIDE RECEPTACLE 48" AFF. COORDINATE EXACT LOCATION WITH CASEWORK.
12. PROVIDE RECEPTACLE FOR REFRIGERATOR.
13. UNDER SINK DISPOSER. PROVIDE WALL SWITCH AND ASSOCIATED WIRING FOR CONTROL OF DISPOSER. COORDINATE LOCATION WITH ARCHITECTURAL CASEWORK.
14. REFER TO C-0-107 FOR CONTIUATION AND E-3-900 FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
15. MAIN GROUNDING BAR.
16. PROVIDE 120V CONNECTION TO ACCESS CONTROL PANEL.
17. PROVIDE 120V CONNECTION TO HVAC DDC CONTROL PANEL.
18. PROVIDE QUAD RECEPTACLE FOR STAMPING AND SORTING MACHINES.
19. PROVIDE TELE-POWER POLE (WIREMOLD AMDTP-4 OR EQUIVALENT) FOR STAMPING AND SORTING MACHINES. POLE SHALL HAVE PROVISIONS FOR TWO (2) DUPLEX RECEPTACLES AND ONE (1) DATA OUTLET. REFER TO E-3-103 FOR ADDITIONAL REQUIREMENTS.
20. PROVIDE NEMA 5-20 RECEPTACLE FOR PARCEL METERING MACHINE.
21. PROVIDE NEMA 5-20 RECEPTACLE FOR PARCEL STRAPPING MACHINE.
22. PROVIDE NEMA 5-20 RECEPTACLE FOR BIO SAFETY CABINET.

EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
1	LETTER STAMPING MACHINE
2	FLAT POST STAMPING MACHINE
3	MULTI STAMPING MACHINE
4	FUTURE STAMPING MACHINE
5	30" X 36" SORTING MACHINE
13	PARCEL METERING MACHINE
14	PARCEL STRAPPING MACHINE
16	BIOLOGICAL SAFETY CABINET
17	DESK AND WORKSTATION
18	COPY MACHINE

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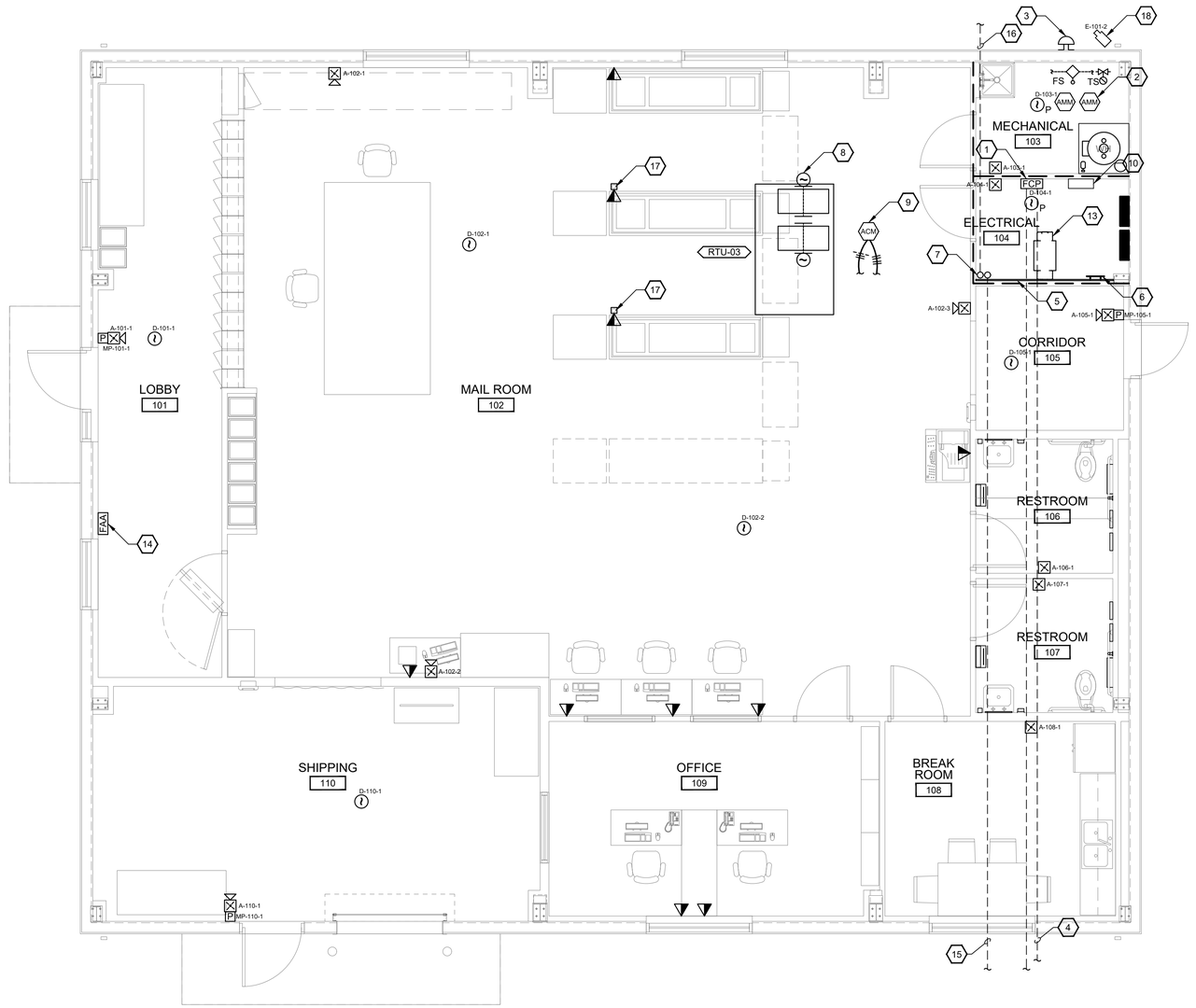
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PROJECT INFORMATION
West Virginia Department of Administration
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Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1
ELECTRICAL POWER PLAN

PATRICK JAYE BAILEY REGISTERED 22277 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
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DESIGNED BY:	KGM
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SHEET NO.	REVISION
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1 E-3-102 **ELECTRICAL SYSTEMS PLAN**

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. INSTALL 1" CONDUIT FROM EACH TELECOMMUNICATIONS OUTLET TO ABOVE CEILING. PROVIDE NYLON BUSHINGS CONDUIT CONNECTORS FOR CABLE PROTECTION.
2. REFER TO DIVISION 27 SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
3. FIRE ALARM SYSTEM SHALL BE CONNECTED AS SHOWN ON THE MANUFACTURER'S SUBMITTAL DRAWINGS, WITH NUMBER OF WIRES AND CONDUIT SIZED AS REQUIRED.
4. THE FIRE ALARM SYSTEM SHALL BE MONITORED BY A U.L. APPROVED CENTRAL MONITORING STATION. THE MONITORING STATION INFORMATION AND THE CORRESPONDING U.L. FILE NUMBER SHALL BE PROVIDED TO THE PROPER APPROVAL AGENCIES BY THE SUCCESSFUL FIRE ALARM MANUFACTURER / SUPPLIER.
5. CONTRACTOR SHALL REFER TO MECHANICAL / FIRE PROTECTION DRAWINGS FOR EXACT LOCATIONS OF ALL TAMPER AND FLOW SWITCHES REQUIRED FOR THE SPRINKLER SYSTEM, INCLUDING EXTERIOR. SWITCHES SHALL BE MONITORED BY THE FIRE ALARM SYSTEM. ALL EXTERIOR FIRE ALARM LINES AHLL BE PROVIDED WITH SURGE PROTECTION.
6. ANY DUCT SMOKE DETECTORS FOR HVAC UNITS THAT ARE NOT DIRECTLY ACCESSIBLE SHALL BE PROVIDED WITH REMOTE-MOUNTED TEST SWITCHES THAT ARE MOUNTED IN AN ACCESSIBLE LOCATION AND LABELED AS TO WHICH UNIT IS MONITORED.
7. ALL FIRE ALARM INDICATING DEVICES ARE TO BE INSTALLED AT 80" OR 6" BELOW CEILING, WHICHEVER IS LOWER.
8. MANUAL PULL STATIONS ARE TO BE INSTALLED NOT LESS THAN 42" AFF OR MORE THAN 48" AFF (TO OPERATING HANDLE).
9. ALL CABLING SHALL BE INSTALLED IN CONDUIT.
10. REFER TO SHEET E-3-900 FOR FIRE ALARM SYSTEM RISER DIAGRAM.
11. ALL DATA RACKS, DATA CABLING, DATA OUTLETS, DATA JACKS, CABLE SUPPORTS, INSTALLATION AND TERMINATION SHALL BE INCLUDED IN THE PROJECT.

⬡ SHEET KEYNOTES:

1. FIRE ALARM CONTROL PANEL. PROVIDE DIGITAL DIALER WITH FIRE ALARM CONTROL PANEL. PROVIDE CAT 6A CABLE IN CONDUIT BETWEEN FIRE ALARM PANEL AND DIGITAL DIALER.
2. ADDRESSABLE FIRE ALARM MONITORING MODULES FOR FIRE PROTECTION RISER (TAMPER/FLOW SWITCHES). MODULES SHALL BE LOCATED WITHIN 3" OF DEVICE MONITORED. COORDINATE WITH FIRE PROTECTION CONTRACTOR FOR NUMBER AND LOCATIONS OF TAMPER AND FLOW SWITCHES.
3. PROVIDE CONNECTION TO FIRE PROTECTION SYSTEM WATER GONG. COORDINATE LOCATION WITH FIRE PROTECTION CONTRACTOR. PROVIDE CONDUIT/WIRING AS REQUIRED FOR CONNECTION TO FIRE ALARM CONTROL PANEL. PROVIDE 120V CONNECTION, IF REQUIRED.
4. PROVIDE 1-1/2" CONDUIT WITH FIRE CABLING TO FIRE PROTECTION VAULT, REFER TO LOCATION SHOWN ON C-0-107.
5. CONTRACTOR SHALL PROVIDE COMMUNICATIONS ROOM WITH 3/4" X 4' X 8' PLYWOOD, RIGIDLY ATTACHED TO WALL MOUNT VERTICALLY WITH TOP OF PLYWOOD AT 8'-0"AFF. PLYWOOD SHALL BE FIRE RATED AND TIA/EIA APPROVED.
6. TELECOMMUNICATIONS MAIN GROUNDING BUSBAR. (TMGB) - 1/4" X 4" X 16" (MIN) GROUND BAR. MOUNT TO WALL WITH NON-CONDUCTIVE MATERIAL.
7. COMMUNICATION SERVICE CONDUITS. PROVIDE ONE (1) 4" CONDUIT AND ONE (1) 2" CONDUIT. STUB UP INTO SECURITY ROOM 119 WITH LONG SWEEP RIGID STEEL ELBOWS.
8. PROVIDE DUCT SMOKE DETECTOR INSTALLED IN AIR DUCT FOR RTU. COORDINATE QUANTITIES AND PLACEMENT WITH LOCAL CODE REQUIREMENTS.
9. ADDRESSABLE FIRE ALARM CONTROL MODULE FOR DUCT SMOKE DETECTOR. PROVIDE FIRE ALARM SIGNALING LINE CIRCUIT (SLC WIRING) TO FIRE ALARM CONTROL PANEL. PROVIDE CONDUIT/WIRING TO HVAC UNIT CONTROLS FOR UNIT SHUTDOWN UPON ACTIVATION OF ASSOCIATED DUCT SMOKE DETECTOR. COORDINATE LOCATION WITH MECHANICAL CONTRACTOR.
10. ACCESS CONTROL SYSTEM PANEL
11. CARD READER. MOUNT AT 42" AFF (TO TOP OF DEVICE.)
12. SINGLE ACCESS DOOR HARDWARE. RFER TO SPECIFICATION SECTION 087100 FOR ADDITIONAL INFORMATION.
13. EQUIPMENT RACK LOCATION FOR BUILDING DATA SYSTEM.
14. FIRE ALARM REMOTE ANNUNCIATOR PANEL TO BE SEMI-FLUSH MOUNTED.
15. COMMUNICATION SERVICE CONDUITS. PROVIDE ONE (1) 4" CONDUIT WITH LONG SWEEP RIGID STEEL ELBOWS. REFER TO SHEET C-0-107 FOR CONTINUATION.
16. COMMUNICATION SERVICE CONDUITS. PROVIDE ONE (1) 2" CONDUIT WITH LONG SWEEP RIGID STEEL ELBOWS. REFER TO SHEET C-0-107 FOR CONTINUATION.
17. PROVIDE DATA PROVISIONS IN TELE-POWER POLE. REFER TO E-3-102 FOR ADDITIONAL REQUIREMENTS.
18. PROTECTIVE SERVICES CAMERA WITH ACCEPTANCE OF ALTERNATE #1, REFER TO E-1-105 FOR BASE BID LOCATION. PROVIDE EXTERIOR CAMERA, REFER TO CAMERA RISER ON E-1-902 FOR MOUNTING REQUIREMENTS AND ADDITIONAL INFORMATION.

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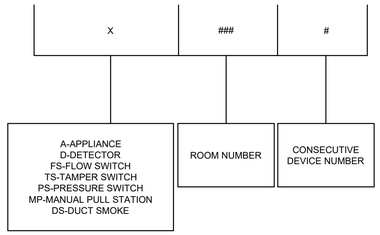
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

CAPITOL MAIL ROOM
ALTERNATE 1
ELECTRICAL SYSTEMS PLAN

PATRICK JAYE BAILEY
REGISTERED
22277
STATE OF WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

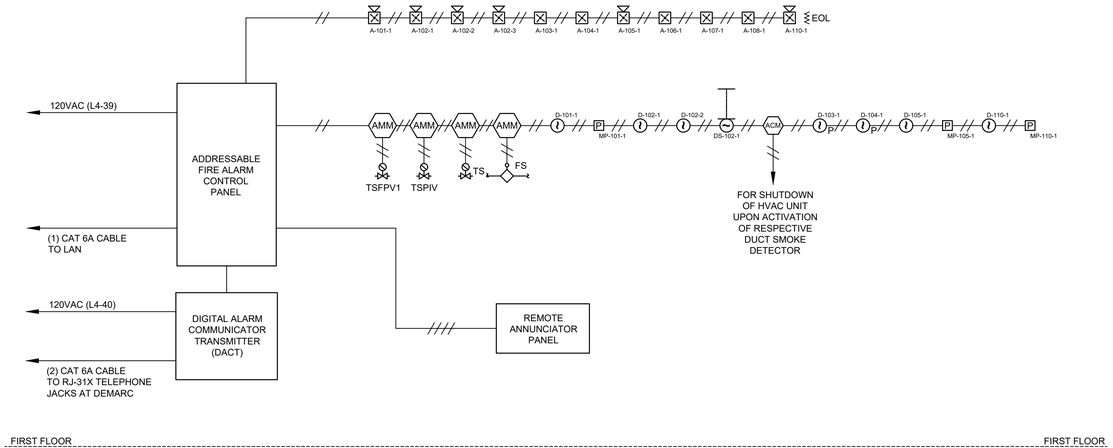
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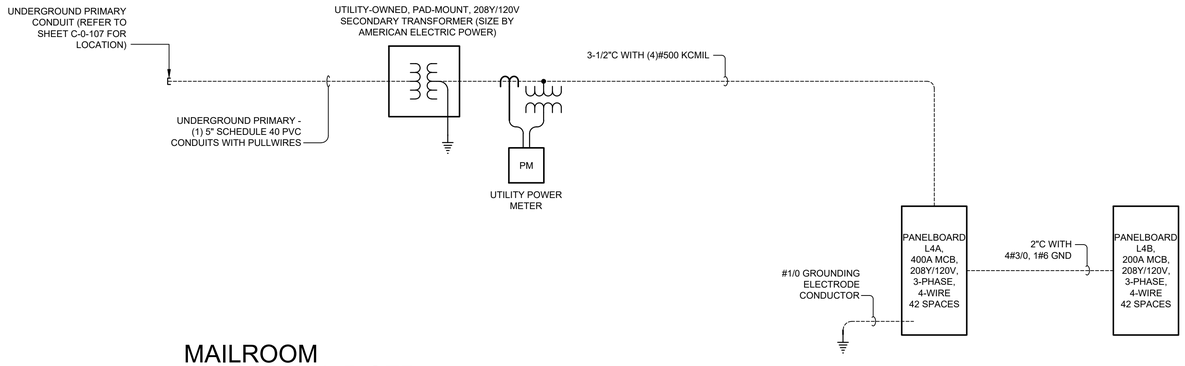
FIRE ALARM ADDRESS DESIGNATIONS

FIRE ALARM RISER NOTES:

1. REFER TO SPECIFICATION SECTION 283100 FIRE ALARM FOR ADDITIONAL INFORMATION.
2. ACTUAL WIRING CONFIGURATION AND TYPE/SIZE OF CONDUCTORS SHALL BE AS RECOMMENDED BY THE FIRE ALARM MANUFACTURER WITHIN MINIMUM REQUIREMENTS STATED IN SPECIFICATIONS.
3. PROVIDE ALL NECESSARY PROGRAMMING, MODULES, ACCESSORIES, ETC., AS REQUIRED TO ACHIEVE CORRECT OPERATION.
4. PROVIDE SURGE SUPPRESSION FOR ALL EXTERIOR CIRCUITS.
5. CANDELA RATINGS OF ALL VISUAL NOTIFICATION APPLIANCES SHALL BE AS DETERMINED BY FIRE ALARM MANUFACTURER WITHIN MINIMUM REQUIREMENTS STATED IN SPECIFICATIONS.



1 MAILROOM BLDG
FIRE ALARM RISER DIAGRAM
NOT TO SCALE



2 MAILROOM
ELECTRICAL RISER
NOT TO SCALE

ELECTRIC RISER NOTES:

1. CONTRACTOR SHALL COORDINATE ALL ACTIVITIES ONSITE WITH AMERICAN ELECTRIC POWER (AEP) PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL ADHERE TO ALL AEP POWER REQUIREMENTS. ANY DEVIATIONS FROM THAT SHOWN ON THE ELECTRICAL DRAWINGS TO MEET ANY REQUIREMENT OF AEP POWER SHALL BE MADE AT THE CONTRACTORS EXPENSE.
3. PRIMARY CONDUCTORS, PAD-MOUNTED TRANSFORMER, TRANSFORMER CT'S/METERING SHALL BE FURNISHED AND INSTALLED BY AEP. AEP WILL MAKE ALL PRIMARY AND SECONDARY TERMINATIONS AT THE TRANSFORMER.
4. PRIMARY CONDUITS W/PULLWIRES, SECONDARY CONDUITS AND CONDUCTORS, TRANSFORMER PAD, AND ALL TRENCHING/BACKFILL SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
5. CONTRACTOR SHALL VERIFY ALL REQUIRED INTERCONNECTION BETWEEN ATS AND GENSET PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE ALL REQUIRED CABLING AS PART OF THE PROJECT.
6. SURGE PROTECTION DEVICES SHALL MEET UL REQUIREMENTS FOR MASTER LABELLED LIGHTNING PROTECTION SYSTEM.

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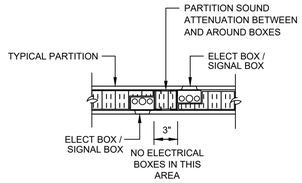
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PROJECT INFORMATION
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Charleston, West Virginia

ELECTRICAL DIAGRAMS
MAILROOM RISERS

PATRICK JAYE BAILEY
REGISTERED
22177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

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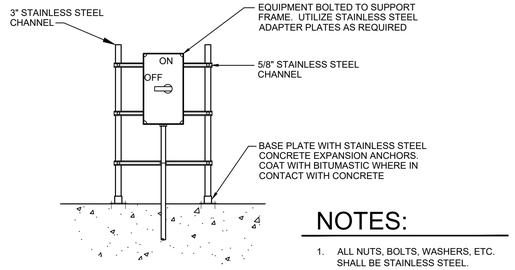


NOTES:

1. ROUGH-IN BOXES MAY BE MOUNTED IN ADJACENT STUD SPACE ONLY IF THE BOXES FACE THE SAME DIRECTION. BACK-TO-BACK BOXES MUST BE SEPARATED PER THIS DETAIL.
2. DO NOT PLACE BOXES BACK-TO-BACK EVEN IF SHOWN GRAPHICALLY ON DRAWINGS AS BACK-TO-BACK. BOXES SHALL BE INSTALLED SEPARATED PER THIS DETAIL. PROVIDE ADDITIONAL METAL FRAMING AS NECESSARY TO INSTALL BOXES SEPARATED AS INDICATED.
3. ELEC/SIGNAL BOXES WITH OPENING AREAS NOT EXCEEDING 16 SQUARE INCHES PLACED IN RATED WALLS FACING IN OPPOSITE DIRECTIONS SHALL BE SEPARATED A MINIMUM OF 24 INCHES. INSTALLATION SHALL BE IN ACCORDANCE WITH KENTUCKY BUILDING CODE SECTION 711.3.2 "MEMBRANE PENETRATIONS".

1 BACK-TO-BACK BOX MOUNTING DETAIL

NOT TO SCALE

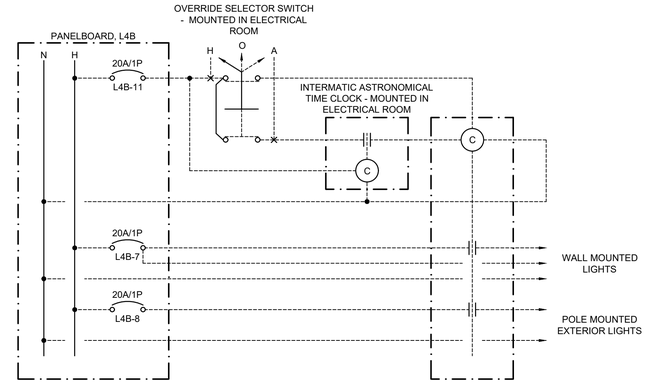


NOTES:

1. ALL NUTS, BOLTS, WASHERS, ETC. SHALL BE STAINLESS STEEL.

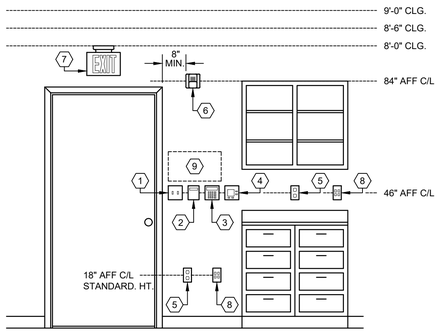
3 TYPICAL RACK MOUNTED ELECTRICAL EQUIPMENT

NOT TO SCALE



5 MAILROOM BLDG EXTERIOR LIGHTING CONTROL

NOT TO SCALE



SHEET KEYNOTES:

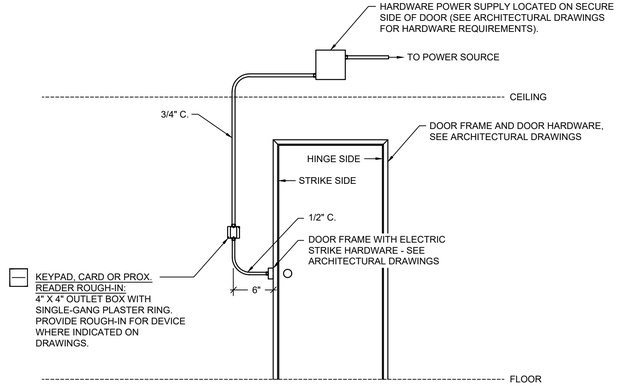
1. MOUNT EDGE OF LIGHTING CONTROL DEVICES CLOSEST TO DOOR AT A DISTANCE OF TWO INCHES FROM THE EDGE OF THE FACE PLATE TO THE DOOR FRAME INCLUDING ALL APPLIED TRIM UNLESS OTHERWISE NOTED. MOUNT REMAINING DEVICES IN THE FOLLOWING ORDER:

   A. FIRE ALARM INITIATION DEVICES.
   B. SECURITY/ACCESS CONTROL DEVICES.
   C. HVAC THERMOSTAT/HUMIDISTAT DEVICES.
   D. OTHER DEVICES.

   MOUNT THE EDGE OF DEVICE OR DEVICE FACE PLATES TWO INCHES APART. PROVIDE BLOCKING AS NECESSARY IN THE WALL OR PROVIDE MANUFACTURED SUPPORTS SIMILAR TO CADDY 'RB' SERIES OR EQUAL. ALL DEVICES TO BE MOUNTED WITH CENTER LINE AT HEIGHT INDICATED.
2. FIRE ALARM INITIATING DEVICE.
3. SECURITY/ACCESS CONTROL KEYPAD.
4. HVAC THERMOSTAT/HUMIDISTAT CONTROL DEVICE.
5. ABOVE COUNTER ELECTRICAL/COMMUNICATIONS DEVICE, COORDINATE MOUNTING HEIGHT WITH ARCHITECTURAL INTERIOR ELEVATIONS. SHOWN AT TYPICAL HEIGHT.
6. FIRE ALARM NOTIFICATION APPLIANCE.
7. INSTALL WALL MOUNTED EXIT SIGNS WITH BOTTOM EDGE OF SIGN APPROXIMATELY FOUR INCHES FROM TOP OF DOOR FRAME.
8. COMMUNICATIONS OUTLET.
9. WHEN SIGNAGE WITH TACTILE CHARACTERS ARE TO BE INSTALLED, THE BOTTOM OF TACTILE SIGNAGE SHALL BE MOUNTED AT 50" AFF MINIMUM WITH THE TOP MOUNTED AT A MAXIMUM OF 60" AFF. PROVIDE A CLEAR SPACE OF 18" IN FRONT OF SIGNAGE. ALL OTHER PROVISIONS AND SPACINGS REQUIRED BY A.D.A. SHALL BE FOLLOWED.

2 DEVICE MOUNTING COORDINATION DETAIL

NOT TO SCALE

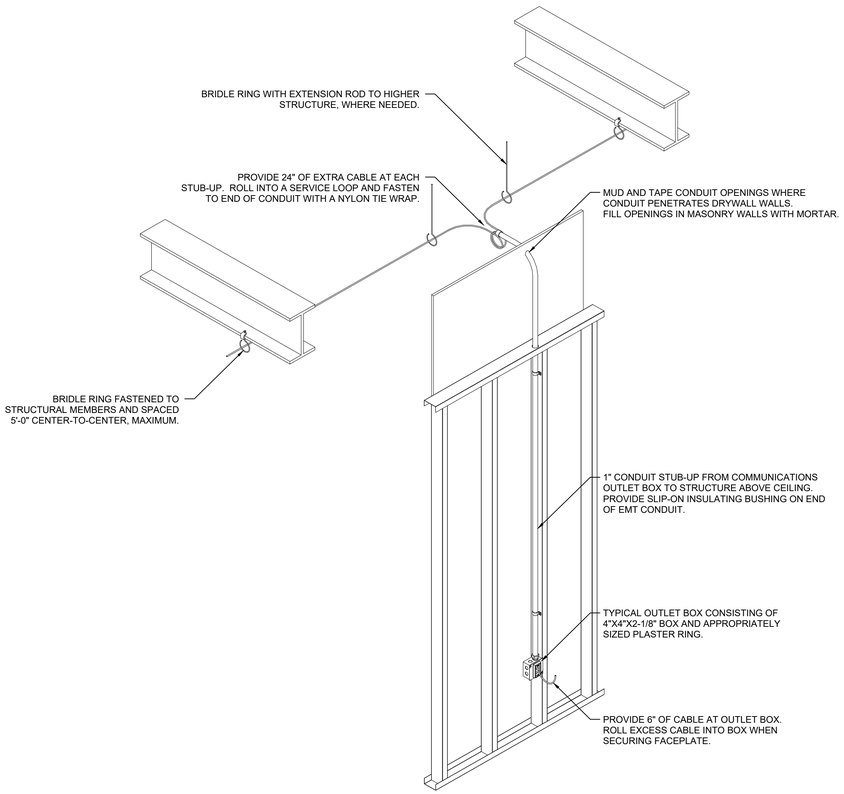


GENERAL NOTES:

1. ALL CONDUIT SHALL BE CONCEALED IN WALLS AND ABOVE CEILING.
2. REFER TO THE DRAWINGS FOR LOCATION AND QUANTITY OF INTERCOM DEVICES, KEYPADS, PROXIMITY AND CARD READERS. ALL DEVICES AND CABLING SHALL BE PROVIDED AND INSTALLED BY OWNER.
3. THE CONTRACTOR SHALL COORDINATE RESPONSIBLITY AND LIMITS OF WORK WITH THE OWNER FOR ALL DEVICES, CONDUIT, WIRE AND OTHER ROUGH-IN WORK REQUIRED.
4. ALL ROUGH-IN FOR DEVICES SHALL BE LOCATED SUCH THAT OPERATING MECHANISM OF DEVICE MEETS THE AMERICAN DISABILITIES ACT. THE CONTRACTOR SHALL CONTACT THE OWNER FOR DEVICE SPECIFICATIONS.
5. IF WALL SPACE IS NOT AVAILABLE FOR INTERCOM, CARD OR PROXIMITY READER, BOXES MAY BE STACKED VERTICALLY WITH MOUNTING HEIGHTS REMAINING WITHIN ADA GUIDELINES.
6. PROVIDE NYLON PULL STRING IN EMPTY CONDUIT.

4 TYPICAL SECURE DOOR WITH ELECTRIC STRIKE DOOR HARDWARE

NOT TO SCALE



6 COMMUNICATIONS ROUGH-IN FOR LIGHT GAUGE FRAMING SYSTEMS

NOT TO SCALE

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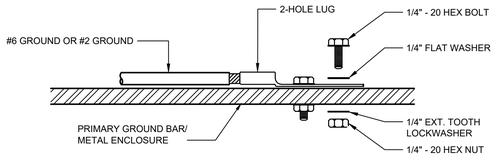
St. Albans, WV (304) 727-5501
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www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL DETAILS I

PATRICK JAYE BEALL — 22477 — REGISTERED — STATE OF WEST VIRGINIA — PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-500	△

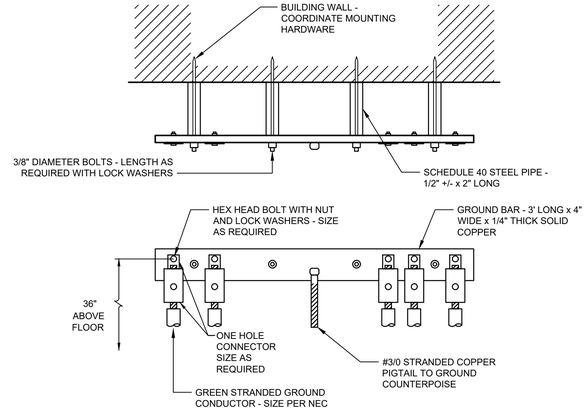


NOTES:

1. SELECT BOLT LENGTH TO PROVIDE A MINIMUM OF TWO EXPOSED THREADS.
2. BURNISH MOUNTING SURFACE TO REMOVE PAINTING IN THE AREA OF LUG CONTACT.
3. APPLY ANTI-OXIDANT COMPOUND TO MATING SURFACE OF LUG AND WIPE CLEAN EXCESS COMPOUND.
4. USE SOLID COPPER WIRE AND MECHANICAL 2-HOLE LUG FOR ALL EXTERIOR GROUNDING.

GROUNDING CONNECTION DETAIL

NOT TO SCALE

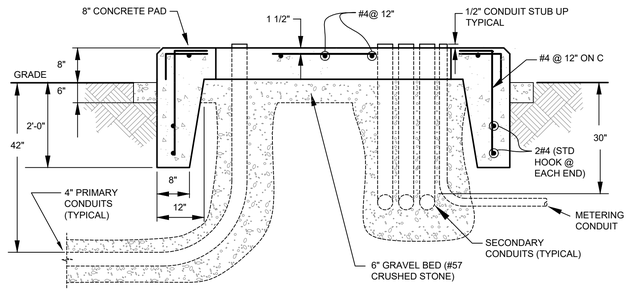


GROUND BAR DETAIL

NOT TO SCALE

1 GROUND BAR CONNECTION DETAILS

NOT TO SCALE



SECTION

NOT TO SCALE

TRANSFORMER PAD
FOUNDATION DIMENSIONS

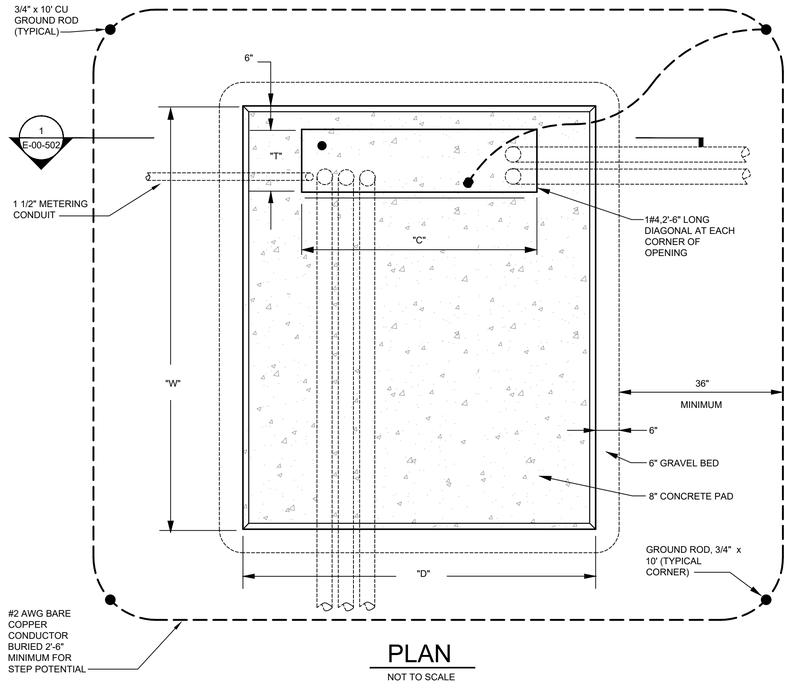
KVA	W	D	C	T
75	5'-0"	7'-6"	4'-6"	16"
112	5'-0"	7'-6"	4'-6"	16"
150	5'-0"	7'-6"	4'-6"	16"
225	7'-0"	7'-6"	4'-6"	16"
300	7'-0"	7'-6"	4'-6"	16"
500	7'-0"	7'-6"	4'-6"	16"
750	9'-0"	9'-0"	5'-0"	16"
1000	9'-0"	9'-0"	5'-0"	16"
1500	9'-0"	9'-0"	5'-0"	16"
2000	9'-0"	9'-0"	5'-0"	16"
2500	9'-0"	9'-0"	5'-0"	16"

NOTES - TRANSFORMER PAD:

1. TRANSFORMER PAD WILL BE A SOLID BLOCK OF CONCRETE WITH DIMENSIONS AS SHOWN, REINFORCED WITH STEEL RODS OR EQUIVALENT, ALL OF WHICH SHALL BE TIED TOGETHER FOR A FIRM AND STRUCTURAL FOUNDATION. PAD SHALL BE POURED ENTIRELY ON SITE, USING CONCRETE OF 3000 P.S.I. STRENGTH (6 BAG MIX). TOP OUTSIDE EDGES OF PAD WILL HAVE 1/2" BEVEL, AND ALL SURFACES WILL BE TROWLED TO A SEMI-SMOOTH FINISH. POURING OR PLACING OF THE PAD WILL BE DONE AFTER THE NECESSARY CONDUITS ARE IN PLACE AND GROUND HAS BEEN MECHANICALLY TAMPED.
2. COORDINATE PAD DIMENSIONS WITH UTILITY COMPANY PRIOR TO FORMING AND MAKE NECESSARY MODIFICATIONS TO SUIT THE UTILITY.
3. CAP BOTH ENDS OF SPARE PRIMARY DUCT.
4. ANCHOR TRANSFORMER PAD WITH 3/8" DIAMETER STAINLESS STEEL ANCHOR BOLTS.
5. ALL GROUNDING CONNECTIONS EXTERNAL TO TRANSFORMER ENCLOSURE SHALL BE EXOTHERMICALLY WELDED.
6. DIMENSIONS ARE INTENDED TO BE 12" LARGER THAN TRANSFORMER IN BOTH DIRECTIONS.
7. DISCONNECT FACTORY Xo JUMPER TO TRANSFORMER ENCLOSURE.
8. MOUNT METER BASE AND CT CABINET ADJACENT TO THE TRANSFORMER - SEE DETAIL 4 THIS SHEET.
9. COORDINATE WITH AEP TO HAVE SERVICE INSTALLED IN COMPLIANCE WITH AEP REQUIREMENTS.

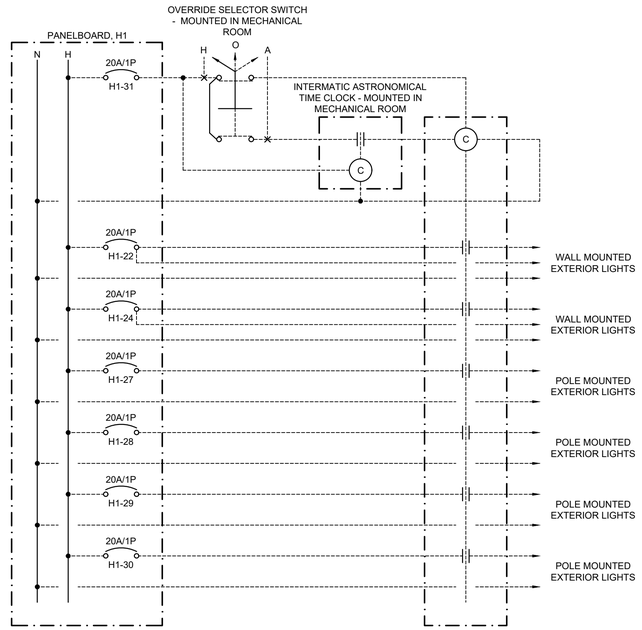
2 TRANSFORMER PAD DETAIL

NOT TO SCALE



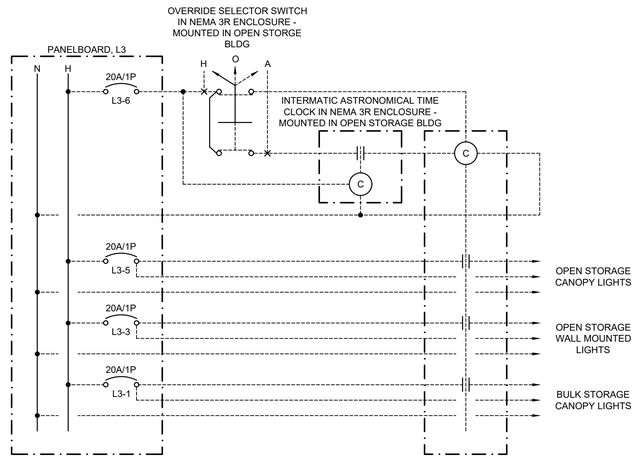
PLAN

NOT TO SCALE



3 WAREHOUSE BLDG EXTERIOR LIGHTING CONTROL

NOT TO SCALE



4 BULK/OPEN STORAGE BLDG EXTERIOR LIGHTING CONTROL

NOT TO SCALE

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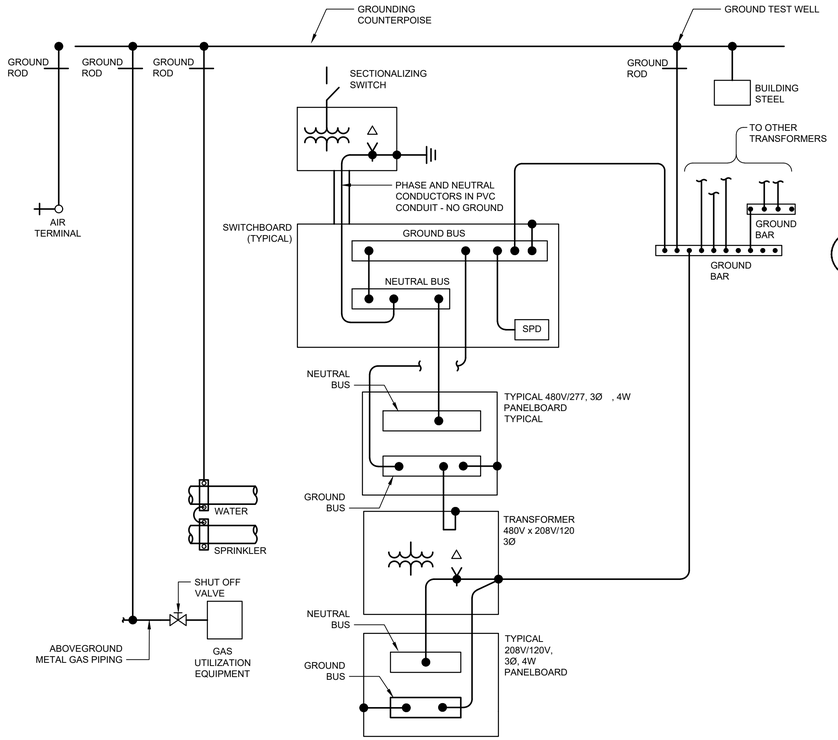
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(304) 472-8914
www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL DETAILS II

PATRICK JAYE BALL
REGISTERED
22277
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-501	

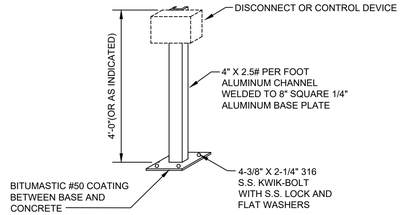


GENERAL NOTES:

1. SEE BUILDING POWER PLANS FOR CONDUCTOR SIZES.

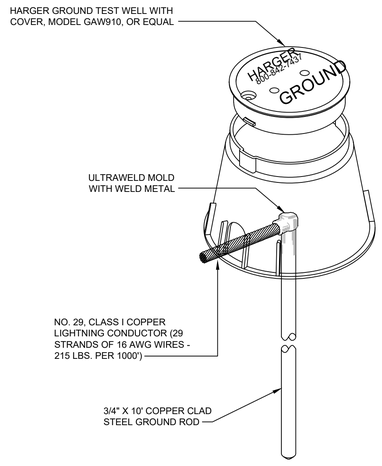
1 TYPICAL BUILDING AREA GROUNDING SCHEMATIC

NOT TO SCALE



2 EQUIPMENT SUPPORT BRACKET

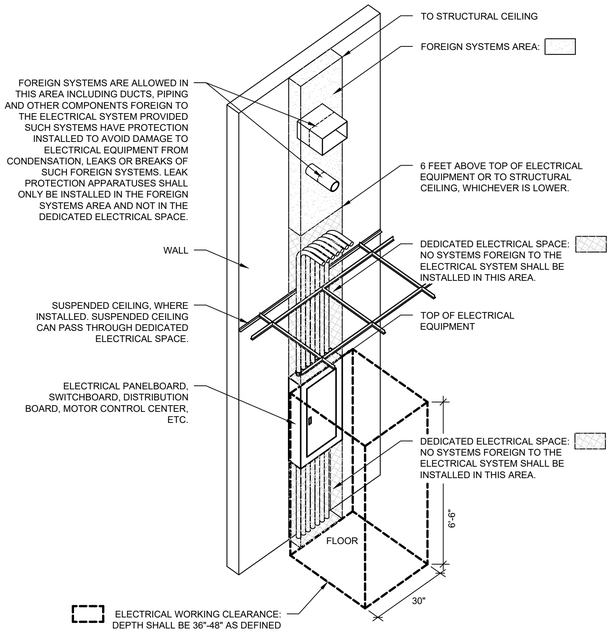
NOT TO SCALE



3 GROUND ROD TEST WELL INSTALLATION

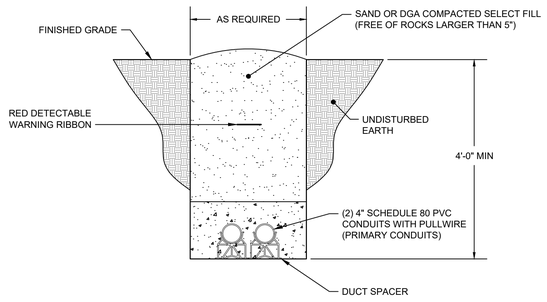
NOT TO SCALE

- ONE REQUIRED AT EACH BUILDING WHERE MAIN GROUNDING ELECTRODE CONDUCTOR GOES TO SERVICE EQUIPMENT.



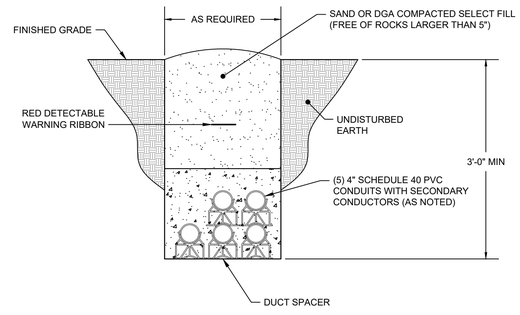
4 DEDICATED ELECTRICAL SPACE/ WORKING CLEARANCE DETAIL

NOT TO SCALE



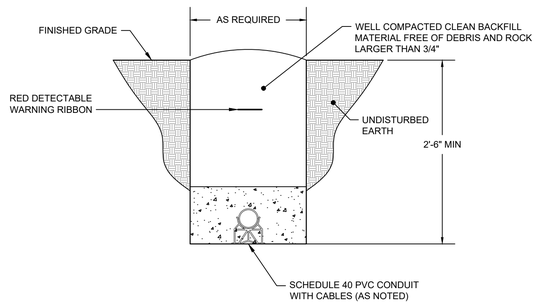
5 PRIMARY TRENCH DETAIL

NOT TO SCALE



6 SECONDARY TRENCH DETAIL

NOT TO SCALE



7 TRENCH DETAIL

NOT TO SCALE

GENERAL NOTES:

1. PROVIDE A MINIMUM OF 2 INCHES OF CONCRETE AROUND ALL SIDES OF DUCT BANKS.
2. SPACING BETWEEN DUCTS SHALL BE 3 INCHES.
3. PROVIDE SPACERS EVERY 10 LINEAR FEET OF CONDUIT, MINIMUM. COORDINATE WITH MANUFACTURER'S RECOMMENDATIONS.
4. PROVIDE TIE WIRE, HOLD DOWNS, TIE WRAPS, ETC. AS REQUIRED FOR DUCT BANK CONSTRUCTION.

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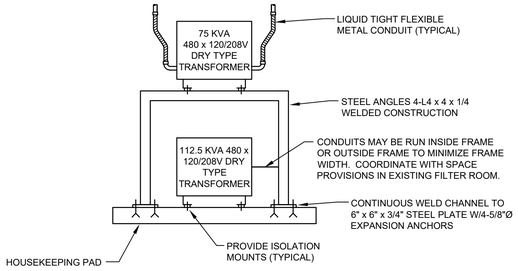
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www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL DETAILS III

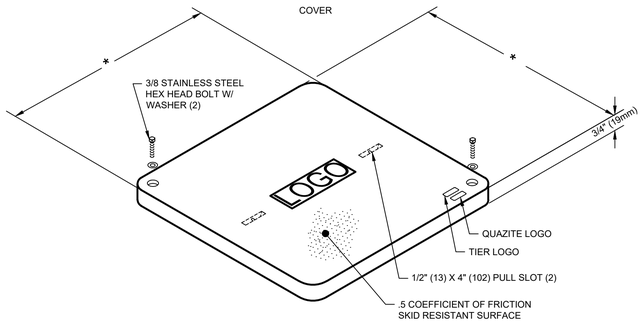
PATRICK JAYE BAILEY REGISTERED 22177 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
8-6-21

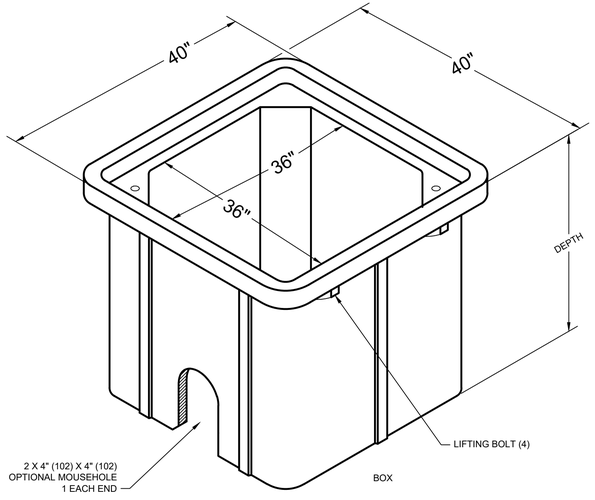
JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-502	△



1 TRANSFORMER RACK MOUNTING DETAIL

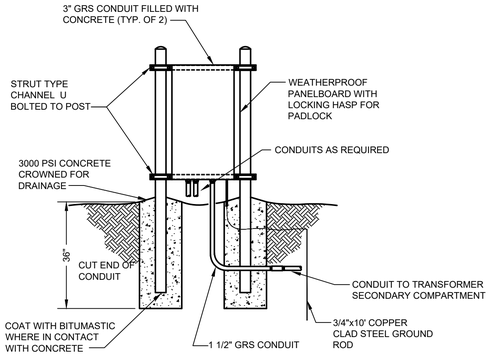
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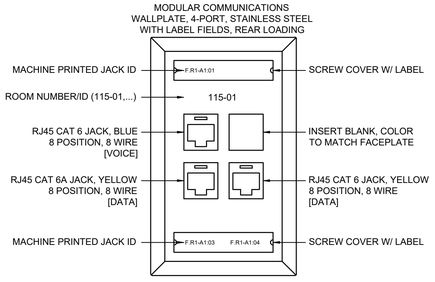
2 TYPICAL INGROUND PULLBOX

NOT TO SCALE



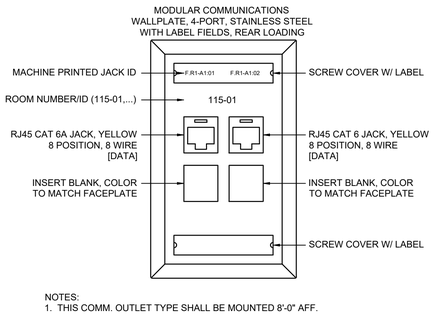
3 TYPICAL FREE STANDING PANELBOARD MOUNTING

NOT TO SCALE



4 COMM. OUTLET - TYPE 'D1'

NOT TO SCALE



NOTES:
1. THIS COMM. OUTLET TYPE SHALL BE MOUNTED 8'-0" AFF.

5 COMM. OUTLET - TYPE 'W1'

NOT TO SCALE

SYSTEM LABELING / WIRING SPECIFICATION

DATA LABELING:

F:XY-R:P

F = TELECOMMUNICATION SPACE
XY = RACK IDENTIFIER
R = PATCH PANEL IDENTIFER
P = PATCH PANEL PORT IDENTIFIER

PATCH PANEL TYPES:

TYPE A - FOR TERMINATION OF BOPNET CABLES ONLY (YELLOW)
TYPE B - FOR TERMINATION OF VOICE CABLES ONLY (BLUE)

COLOR CODE TELECOMMUNICATION OUTLETS AND CABLING AS FOLLOWS:

DATA - YELLOW
VOICE - BLUE

NOTES:
1. DATA/VOICE/AUDIO/VISUAL CABLING: CATEGORY 6A UTP CABLE (JACKET COLOR AS INDICATED OR SPECIFIED ELSEWHERE)
2. VERIFY LABELING STANDARD WITH WVOT PRIOR TO CABLING INSTALLATION.

REVISION NUMBER	REVISIONS	DATE	BY

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL DETAILS IV

PATRICK JAYE BAILEY
REGISTERED
22277
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-503	

LIGHT FIXTURE SCHEDULE

TYPE	DESCRIPTION	COLOR TEMP	LAMP TYPE	LUMENS	WATTS	VOLTAGE	MOUNTING TYPE	MOUNTING HEIGHT	MANUFACTURER	MODEL NUMBER	EQUIVALENT MANUFACTURER
LF-1A	2X4 TROFFER	3500K	LED	2,962	24	277	RECESSED	CEILING HT	LITHONIA	2BLT4-30L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1AE	2X4 TROFFER W/ BATTERY BACKUP	3500K	LED	2,962	24	277	RECESSED	CEILING HT	LITHONIA	2BLT4-30L-ADP-GZ1-LP835-EL14LSD	COLUMBIA, EATON OR APPROVED EQUAL
LF-1B	2X4 TROFFER	3500K	LED	4,000	32	277	RECESSED	CEILING HT	LITHONIA	2BLT4-40L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1BE	2X4 TROFFER W/ BATTERY BACKUP	3500K	LED	4,000	32	277	RECESSED	CEILING HT	LITHONIA	2BLT4-40L-ADP-GZ1-LP835-EL14LSD	COLUMBIA, EATON OR APPROVED EQUAL
LF-1C	2X4 TROFFER	3500K	LED	4,960	38	277	RECESSED	CEILING HT	LITHONIA	2BLT4-48L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1D	2X4 TROFFER	3500K	LED	6,016	48	277	RECESSED	CEILING HT	LITHONIA	2BLT4-60L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1DE	2X4 TROFFER W/ BATTERY BACKUP	3500K	LED	6,016	48	277	RECESSED	CEILING HT	LITHONIA	2BLT4-60L-ADP-GZ1-LP835-EL14LSD	COLUMBIA, EATON OR APPROVED EQUAL
LF-1F	2X4 TROFFER	3500K	LED	2,962	24	120	RECESSED	CEILING HT	LITHONIA	2BLT4-30L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1FE	2X4 TROFFER W/ BATTERY BACKUP	3500K	LED	2,962	24	120	RECESSED	CEILING HT	LITHONIA	2BLT4-30L-ADP-GZ1-LP835-EL14LSD	COLUMBIA, EATON OR APPROVED EQUAL
LF-1G	2X4 TROFFER	3500K	LED	4,000	32	120	RECESSED	CEILING HT	LITHONIA	2BLT4-40L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1GE	2X4 TROFFER W/ BATTERY BACKUP	3500K	LED	4,000	32	120	RECESSED	CEILING HT	LITHONIA	2BLT4-40L-ADP-GZ1-LP835-EL14LSD	COLUMBIA, EATON OR APPROVED EQUAL
LF-1H	2X4 TROFFER	3500K	LED	4,960	38	120	RECESSED	CEILING HT	LITHONIA	2BLT4-48L-ADP-GZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-1HE	2X4 TROFFER W/ BATTERY BACKUP	3500K	LED	4,960	38	120	RECESSED	CEILING HT	LITHONIA	2BLT4-48L-ADP-GZ1-LP835-EL14LSD	COLUMBIA, EATON OR APPROVED EQUAL
LF-1JE	2X4 TROFFER (DRY WALL MOUNT) W/ BATTERY BACKUP	3500K	LED	2,962	24	120	RECESSED	CEILING HT	LITHONIA	2BLT4-30L-ADP-GZ1-LP835-EL14LSD-DGA24	COLUMBIA, EATON OR APPROVED EQUAL
LF-2A	LED HIGH BAY	4000K	LED	11,306	82	277	SUSPENDED	14'-0"	LITHONIA	IBE-L24-12000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU	COLUMBIA, EATON OR APPROVED EQUAL
LF-2AE	LED HIGH BAY W/ BATTERY BACKUP	4000K	LED	11,306	82	277	SUSPENDED	14'-0"	LITHONIA	IBE-L24-12000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU-E15WCP-BPK	COLUMBIA, EATON OR APPROVED EQUAL
LF-2B	LED HIGH BAY	4000K	LED	13,967	105	277	SUSPENDED	14'-0"	LITHONIA	IBE-L24-22000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LCH0SZU	COLUMBIA, EATON OR APPROVED EQUAL
LF-2BE	LED HIGH BAY W/ BATTERY BACKUP	4000K	LED	13,967	105	277	SUSPENDED	14'-0"	LITHONIA	IBE-L24-15000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU	COLUMBIA, EATON OR APPROVED EQUAL
LF-2C	LED HIGH BAY	4000K	LED	21,067	165	277	SUSPENDED	28'-0"	LITHONIA	IBE-L24-15000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU-E15WCP-BPK	COLUMBIA, EATON OR APPROVED EQUAL
LF-2CE	LED HIGH BAY W/ BATTERY BACKUP	4000K	LED	21,067	165	277	SUSPENDED	28'-0"	LITHONIA	IBE-L24-22000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LCH0SZU-E15WCP-BPK	COLUMBIA, EATON OR APPROVED EQUAL
LF-2D	LED HIGH BAY	4000K	LED	13,967	105	120	SUSPENDED	14'-0"	LITHONIA	IBE-L24-15000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU	COLUMBIA, EATON OR APPROVED EQUAL
LF-2DE	LED HIGH BAY W/ BATTERY BACKUP	4000K	LED	13,967	105	120	SUSPENDED	14'-0"	LITHONIA	IBE-L24-15000LM-ATC-MD-MVOLT-GZ10-40K-80CRI-LBH0SZU-E15WCP-BPK	COLUMBIA, EATON OR APPROVED EQUAL
LF-3A	LED STRIP LIGHT	3500K	LED	5,456	41	277	SUSPENDED	8'-0"	LITHONIA	ZL1D-L48-5000LM-FST-MVOLT-35K-80CRI	COLUMBIA, EATON OR APPROVED EQUAL
LF-3AE	LED STRIP LIGHT W/ BATTERY BACKUP	3500K	LED	5,456	41	277	SUSPENDED	8'-0"	LITHONIA	ZL1D-L48-5000LM-FST-MVOLT-35K-80CRI-E7W	COLUMBIA, EATON OR APPROVED EQUAL
LF-3B	LED STRIP LIGHT	3500K	LED	11,267	81	277	SUSPENDED	14'-0"	LITHONIA	TZL1D-L96-10000LM-FST-MVOLT-35K-80CRI	COLUMBIA, EATON OR APPROVED EQUAL
LF-3BE	LED STRIP LIGHT W/ BATTERY BACKUP	3500K	LED	11,267	81	277	SUSPENDED	14'-0"	LITHONIA	TZL1D-L96-10000LM-FST-MVOLT-35K-80CRI-2E7W	COLUMBIA, EATON OR APPROVED EQUAL
LF-3CE	LED STRIP LIGHT W/ BATTERY BACKUP	3500K	LED	5,456	41	120	SUSPENDED	10'-0"	LITHONIA	ZL1D-L48-5000LM-FST-MVOLT-35K-80CRI-E7W	COLUMBIA, EATON OR APPROVED EQUAL
LF-4A	LED VAPOR TIGHT LINEAR	4000K	LED	5,365	49	277	SURFACE	CEILING HT	LITHONIA	XVML-L48-5000LM-MVOLT-40K-80CRI	COLUMBIA, EATON OR APPROVED EQUAL
LF-4AE	LED VAPOR TIGHT LINEAR W/ BATTERY BACKUP	4000K	LED	5,365	49	277	SURFACE	CEILING HT	LITHONIA	XVML-L48-5000LM-MVOLT-40K-80CRI-E7W	COLUMBIA, EATON OR APPROVED EQUAL
LF-5A	CAN LIGHT	3500K	LED	950	11	277	RECESSED	CEILING HT	LITHONIA	LDN6-35/10-L06-AR-LD-MVOLT-GZ10	COLUMBIA, EATON OR APPROVED EQUAL
LF-5AE	CAN LIGHT	3500K	LED	950	11	277	RECESSED	CEILING HT	LITHONIA	LDN6-35/10-L06-AR-LD-MVOLT-GZ10-ELR	COLUMBIA, EATON OR APPROVED EQUAL
LF-6A	LED LOW BAY	3500K	LED	8,706	75	277	SUSPENDED	16'-0"	LITHONIA	MSL-8000LM-L/LV-MVOLT-GZ10-35K-80CRI	COLUMBIA, EATON OR APPROVED EQUAL
LF-6AE	LED LOW BAY W/ BATTERY BACKUP	3500K	LED	8,706	75	277	SUSPENDED	16'-0"	LITHONIA	MSL-8000LM-L/LV-MVOLT-GZ10-35K-80CRI-E7W	COLUMBIA, EATON OR APPROVED EQUAL
LF-7A	WALL MOUNT LINEAR	3500K	LED	5,137	40	277	WALL MOUNT	8'-0"	LITHONIA	BLWP4-48L-ADP-EZ1-LP835	COLUMBIA, EATON OR APPROVED EQUAL
LF-7AE	WALL MOUNT LINEAR W/ BATTERY BACKUP	3500K	LED	5,137	40	277	WALL MOUNT	8'-0"	LITHONIA	BLWP4-48L-ADP-EZ1-LP835-E10WLCP	COLUMBIA, EATON OR APPROVED EQUAL
X	EXIT LIGHT		LED			277	WALL MOUNT	7'-6"	LITHONIA	LQM-S-W-R-120/277-EL N-SD	COLUMBIA, EATON OR APPROVED EQUAL
X1	EXIT LIGHT		LED			120	WALL MOUNT	7'-6"	LITHONIA	LHQM-LED-W-R-HO RO-SD	COLUMBIA, EATON OR APPROVED EQUAL
OLF1A	WALL PACK	4000K	LED	3,028	24	277	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T2S-MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF1AE	WALL PACK W/ BATTERY BACKUP	4000K	LED	3,028	24	277	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T2S-MVOLT-ELCW	COLUMBIA, EATON OR APPROVED EQUAL
OLF1B	WALL PACK	4000K	LED	2,905	24	277	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T4M-MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF1BE	WALL PACK W/ BATTERY BACKUP	4000K	LED	2,905	24	277	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T4M-MVOLT-ELCW	COLUMBIA, EATON OR APPROVED EQUAL
OLF1CE	WALL PACK W/ BATTERY BACKUP	4000K	LED	4,201	36	277	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-530-40K-T4M-MVOLT-ELCW	COLUMBIA, EATON OR APPROVED EQUAL
OLF1D	WALL PACK	4000K	LED	2,905	24	120	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T4M-MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF1DE	WALL PACK W/ BATTERY BACKUP	4000K	LED	2,905	24	120	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T4M-MVOLT-ELCW	COLUMBIA, EATON OR APPROVED EQUAL
OLF1F	WALL PACK	4000K	LED	2,965	24	120	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-T3M-MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF1G	WALL PACK	4000K	LED	3,019	24	120	WALL MOUNT	10'-0"	LITHONIA	DSXW1-LED-20C-350-40K-TFTM-MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF2A	POLE LIGHT	4000K	LED	3,863	38	277	POLE MOUNT	20'-0"	LITHONIA	DSX0 LED P1 40K BLC MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF2B	POLE LIGHT	4000K	LED	4,726	38	277	POLE MOUNT	20'-0"	LITHONIA	DSX0 LED P1 40K T2M MVOLT HS	COLUMBIA, EATON OR APPROVED EQUAL
OLF2C	POLE LIGHT	4000K	LED	8,452	71	277	POLE MOUNT	20'-0"	LITHONIA	DSX0 LED P3 40K T3M MVOLT HS	COLUMBIA, EATON OR APPROVED EQUAL
OLF2D	POLE LIGHT	4000K	LED	11,047	92	277	POLE MOUNT	20'-0"	LITHONIA	DSX0 LED P4 40K T5W MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF2F	POLE LIGHT	4000K	LED	8,452	71	120	POLE MOUNT	20'-0"	LITHONIA	DSX0 LED P3 40K T3M MVOLT HS	COLUMBIA, EATON OR APPROVED EQUAL
OLF2G	POLE LIGHT	4000K	LED	11,047	92	120	POLE MOUNT	20'-0"	LITHONIA	DSX0 LED P4 40K T5W MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF3A	CANOPY LIGHT	4000K	LED	10,724	107	120	SURFACE	CEILING HT	LITHONIA	DSXSC LED 30C 1000 40K T5E MVOLT	COLUMBIA, EATON OR APPROVED EQUAL
OLF4AE	EMERGENCY WALL LIGHT		LED			120	SURFACE	7'-6"	LITHONIA	ELA-B-T-QWP-L0309-SD	COLUMBIA, EATON OR APPROVED EQUAL

REVISION NUMBER	REVISIONS	DATE	BY

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL SCHEDULES
LIGHT FIXTURE SCHEDULE

PATRICK JAYE BAILEY
REGISTERED
22177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	E-600
REVISION	△

PANEL SCHEDULE	L1				VOLTAGE		208Y/120V, 3-PHASE, 4-WIRE					
LOCATION	GSD BLDG - MECHANICAL 109				MAINS AMPACITY		225A					
ENCLOSURE	NEMA 1				MAIN CB SIZE		110A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		42					
AIC RATING	10,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
IR-1 - 101	50	1	15A	2#12,1#12G,3/4"C	1				2	2#12,1#12G,3/4"C	15A	1	900	VP-01 - 101
IR-2 - 100	50	1	15A	2#12,1#12G,3/4"C	3				4	2#12,1#12G,3/4"C	15A	1	110	AHU-1
AHU-2	170	1	15A	2#12,1#12G,3/4"C	5				6	2#12,1#12G,3/4"C	15A	1	1000	WATER HEATER
PP-1-2	500	1	15A	2#12,1#12G,3/4"C	7				8	2#12,1#12G,3/4"C	15A	1	500	PP-1-1
MSOU/MSIU-1 - 119	1320	2	15A	2#12,1#12G,3/4"C	9				10	2#12,1#12G,3/4"C	15A	1	50	IR-3 - 123
---	1320				11				12	2#12,1#12G,3/4"C	15A	1	900	VP-02 - 123
IR-4 - 126	50	1	15A	2#12,1#12G,3/4"C	13				14	2#12,1#12G,3/4"C	20A	1	500	DDC CONTROL - 109
VP-03 - 126	900	1	15A	2#12,1#12G,3/4"C	15				16	2#12,1#12G,3/4"C	20A	1	500	FIRE ALARM - 119
LIGHTS - 126	420	1	20A	2#12,1#12G,3/4"C	17				18	2#12,1#12G,3/4"C	20A	1	500	FIRE ALARM - 119
FIRE ALARM - 119	500	1	20A	2#12,1#12G,3/4"C	19				20	2#12,1#12G,3/4"C	20A	1	1000	ACCESS CONTROL - 119
GENERATOR	1000	1	20A	2#12,1#12G,3/4"C	21				22	2#12,1#12G,3/4"C	15A	1	646	EF-1 - 100
EF-2 - 101A	180	1	15A	2#12,1#12G,3/4"C	23				24	2#12,1#12G,3/4"C	15A	1	336	EF-3 - 109
EF-4 - 123	300	1	15A	2#12,1#12G,3/4"C	25				26	2#12,1#12G,3/4"C	15A	1	54	EF-5 - 123
EF-7 - 126	300	1	15A	2#12,1#12G,3/4"C	27				28					
					29				30					
					31				32					
SPARE		1	20A		33				34		20A	1		SPARE
SPARE		1	20A		35				36		20A	1		SPARE
SPARE		1	20A		37				38		20A	1		SPARE
SPARE		1	20A		39				40		20A	1		SPARE
SPARE		1	20A		41				42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE														
TOTAL AMPERES PER PHASE														
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L2A				VOLTAGE		208Y/120V, 3-PHASE, 4-WIRE					
LOCATION	GSD BLDG - WAREHOUSE 107				MAINS AMPACITY		225A					
ENCLOSURE	NEMA 1				MAIN CB SIZE		175A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		42					
AIC RATING	10,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RECEPT - 100/101	900	1	20A	2#12,1#12G,3/4"C	1	1400			2	3#12,1#12G,3/4"C	15A	3	500	OVERHEAD DOOR - 100
OVERHEAD DOOR - 100	500	3	15A	3#12,1#12G,3/4"C	3		1000		4				500	---
---	500				5			1000	6				500	---
---	500				7	800			8	2#12,1#12G,3/4"C	15A	1	300	DOCK LEVELER - 100
RECEPT - 100/104	1000	1	20A	2#12,1#12G,3/4"C	9		1900		10	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 102/103
COMPUTER - 104	1200	1	20A	2#12,1#12G,3/4"C	11			2100	12	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 102/104
COPIER - 104	1000	1	20A	2#12,1#12G,3/4"C	13	1540			14	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 105
COMPUTER - 105	1200	1	20A	2#12,1#12G,3/4"C	15		2400		16	2#12,1#12G,3/4"C	20A	1	1200	COMPUTER - 104
RECEPT - 104/106	1080	1	20A	2#12,1#12G,3/4"C	17			2080	18	2#12,1#12G,3/4"C	20A	1	1000	WATER DISP - 104
RECEPT - 104/107	900	1	20A	2#12,1#12G,3/4"C	19	1620			20	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 107
PLUG STRIP - 104	1200	1	20A	2#12,1#12G,3/4"C	21		2400		22	2#12,1#12G,3/4"C	20A	1	1200	PLUG STRIP - 104
PLUG STRIP - 104	1200	1	20A	2#12,1#12G,3/4"C	23			2400	24	2#12,1#12G,3/4"C	20A	1	1200	PLUG STRIP - 104
PLUG STRIP - 104	1200	1	20A	2#12,1#12G,3/4"C	25	2400			26	2#12,1#12G,3/4"C	20A	1	1200	PLUG STRIP - 104
PLUG STRIP - 104	1200	1	20A	2#12,1#12G,3/4"C	27		2400		28	2#12,1#12G,3/4"C	20A	1	1200	PLUG STRIP - 104
VEHICLE RESTRAINT SYS - 100	500	1	20A	2#12,1#12G,3/4"C	29			500	30					
					31	0			32					
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
SPARE		1	20A		37	0			38		20A	1		SPARE
SPARE		1	20A		39		0		40		20A	1		SPARE
SPARE		1	20A		41			0	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						7760	10100	8080						
TOTAL AMPERES PER PHASE						64.7	84.2	67.3						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L2B				VOLTAGE		208Y/120V, 3-PHASE, 4-WIRE					
LOCATION	GSD BLDG - MECHANICAL 109				MAINS AMPACITY		225A					
ENCLOSURE	NEMA 1				MAIN CB SIZE		175A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		42					
AIC RATING	10,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RECEPT - 109	720	1	20A	2#12,1#12G,3/4"C	1	1540			2	2#12,1#12G,3/4"C	20A	1	820	RECEPT - 110-112
RECEPT - 111-113	1000	1	20A	2#12,1#12G,3/4"C	3		1900		4	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 114/116
RECEPT - 115/118	900	1	20A	2#12,1#12G,3/4"C	5			2100	6	2#12,1#12G,3/4"C	20A	1	1200	RECEPT - 119
RECEPT - 119	1200	1	20A	2#12,1#12G,3/4"C	7	2400			8	2#12,1#12G,3/4"C	20A	1	1200	RECEPT - 119
RECEPT - 119	1200	1	20A	2#12,1#12G,3/4"C	9		1700		10	2#12,1#12G,3/4"C	20A	1	500	TIME CLOCK - 118
COMPUTER - 118	1200	1	20A	2#12,1#12G,3/4"C	11			2200	12	2#12,1#12G,3/4"C	20A	1	1000	COPIER - 118
WATER DISP - 118	1000	1	20A	2#12,1#12G,3/4"C	13	2200			14	2#12,1#12G,3/4"C	20A	1	1200	MICROWAVE - 118
RECEPT - 118	720	1	20A	2#12,1#12G,3/4"C	15		1440		16	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 118
REFRIGERATOR - 118	500	1	20A	2#12,1#12G,3/4"C	17			1000	18	2#12,1#12G,3/4"C	20A	1	500	ICE MACHINE - 118
RECEPT - 120	540	1	20A	2#12,1#12G,3/4"C	19	1080			20	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 121
RECEPT - 122	540	1	20A	2#12,1#12G,3/4"C	21		1740		22	2#12,1#12G,3/4"C	20A	1	1200	COMPUTER - 120
COMPUTER - 121	1200	1	20A	2#12,1#12G,3/4"C	23			2400	24	2#12,1#12G,3/4"C	20A	1	1200	COMPUTER - 122
PALLET JACK - 107	1000	1	20A	2#12,1#12G,3/4"C	25	1900			26	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 107
RECEPT - 107	720	1	20A	2#12,1#12G,3/4"C	27		1260		28	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 107
DISPOSAL - 118	700	1	20A	2#12,1#12G,3/4"C	29			1700	30	2#12,1#12G,3/4"C	20A	1	1000	FUEL SYSTEM CONTROL
					31	0			32					
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
SPARE		1	20A		37	0			38		20A	1		SPARE
SPARE		1	20A		39		0		40		20A	1		SPARE
SPARE		1	20A		41			0	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						9120	8040	9400						
TOTAL AMPERES PER PHASE						76	67	78.3						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L2C				VOLTAGE		208Y/120V, 3-PHASE, 4-WIRE					
LOCATION	GSD BLDG - MAINTENANCE 125				MAINS AMPACITY		225A					
ENCLOSURE	NEMA 1				MAIN CB SIZE		175A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		42					
AIC RATING	10,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
OVERHEAD DOOR - 123	500	3	15A	3#12,1#12G,3/4"C	1	1580			2	2#12,1#12G,3/4"C	20A	1	1080	RECEPT - 123/125
---	500				3		1500		4	2#12,1#12G,3/4"C	20A	1	1000	RECEPT - 123/124
---	500				5			1400	6	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 125
BANDSAW - 125 (MA14)	1300	1	20A	2#12,1#12G,3/4"C	7	3100			8	2#12,1#12G,3/4"C	20A	1	1800	PANELSAW - 125 (MA2)
RECEPT - 125	720	1	20A	2#12,1#12G,3/4"C	9		1440		10	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 125
DRILL PRESS - 125 (MA5)	1080	1	20A	2#12,1#12G,3/4"C	11			2880	12	2#12,1#12G,3/4"C	20A	1	1800	JOINER - 125 (MA7)
PLANER/MOLDER - 125 (MA8)	1800	1	30A	2#10,1#10G,1"C	13	2520			14	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 125
RECEPT - 125	720	1	20A	2#12,1#12G,3/4"C	15		1220		16	3#12,1#12G,3/4"C	15A	3	500	OVERHEAD DOOR - 125
SLIDE GATE - EXT	1175	1	20A	2#12,1#12G,3/4"C	17			1675	18				500	---
FINISHER - 125 (MA12)	1440	1	20A	2#12,1#12G,3/4"C	19	1940			20				500	---
RADIAL ARM SAW - 125 (MA11)	1680	1	20A	2#12,1#12G,3/4"C	21		3480		22	2#12,1#12G,3/4"C	20A	1	1800	MITER SAW - 125 (MA10)
RECEPT - 125	720	1	20A	2#12,1#12G,3/4"C	23			1440	24	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 125
WELDER - 125	1920	1	30A	2#10,1#10G,1"C	25	2420			26	2#12,1#12G,3/4"C	15A	1	500	WELDING HOOD - 125
WELDER - 125	1920	1	30A	2#10,1#10G,1"C	27		2820		28	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 125
DRILL PRESS - 125 (ME8)	1080	1	20A	2#12,1#12G,3/4"C	29			2580	30	2#10,1#10G, 3/4"C	30A	2	1500	WELDER - 125
BLAST CABINET - 125 (ME10)	1000	1	20A	2#12,1#12G,3/4"C	31	2500			32				1500	
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
SPARE		1	20A		37	0			38		20A	1		SPARE
SPARE		1	20A		39		0		40		20A	1		SPARE
SPARE		1	20A		41			0	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						14060	10460	9975						
TOTAL AMPERES PER PHASE						117.2	87.2	83.1						
**GFI CIRCUIT BREAKER														

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

AIRPORT PLANNING / DEVELOPMENT
ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
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St. Albans, WV
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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL SCHEDULES
PANEL SCHEDULES I

PATRICK JAYE BAILEY
REGISTERED
022177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-601	△

PANEL SCHEDULE	L2D				VOLTAGE			208Y/120V, 3-PHASE, 4-WIRE				
LOCATION	GSD BLDG - MECHANICS 126				MAINS AMPACITY			225A				
ENCLOSURE	NEMA 1				MAIN CB SIZE			110A				
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES			42				
AIC RATING	10,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
OVERHEAD DOOR - 126	500	3	15A	3#12,1#12G,3/4"C	1	1940			2	3#10,1#10G,3/4"C	25A	2	1440	GOLF CART LIFT - 126 (ME12)
---	500				3		1940		4				1440	---
---	500				5			1040	6	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 126
AIR COMPRESSOR - 126	2760	2	50A	3#8,1#10G,1"C	7	3760			8	2#12,1#12G,3/4"C	20A	1	1000	RECEPT - 126
---	2760				9		3300		10	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 126
DRILL PRESS - 126 (ME8)	1080	1	20A	2#12,1#12G,3/4"C	11			2016	12	2#12,1#12G,3/4"C	20A	1	936	VES HOSE REEL - 126
RECEPT - 126	540	1	20A	2#12,1#12G,3/4"C	13	640			14	2#12,1#12G,3/4"C	20A**	1	100	CORD REEL RECEPT - 126
CORD REEL LIGHT - 126	300	1	20A**	2#12,1#12G,3/4"C	15		2220		16	2#10,1#10G,3/4"C	30A	1	1920	WELDER - 126
PARTS WASH - 126 (ME9)	500	1	20A	2#12,1#12G,3/4"C	17			1040	18	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 126
RECEPT - 126	1200	1	20A	2#12,1#12G,3/4"C	19	2200			20	2#12,1#12G,3/4"C	20A	1	1000	O/W SEPARATOR PANEL
					21		0		22					
					23			0	24					
					25	0			26					
					27		0		28					
					29			0	30					
					31	0			32					
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
SPARE		1	20A		37	0			38		20A	1		SPARE
SPARE		1	20A		39		0		40		20A	1		SPARE
SPARE		1	20A		41			0	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						8540	7460	4096						
TOTAL AMPERES PER PHASE						71.2	62.2	34.1						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L2MA			VOLTAGE	120/240V, 1-PHASE, 3-WIRE
LOCATION	GSD BLDG - MAINTENANCE 125			MAINS AMPACITY	125A
ENCLOSURE	NEMA 1			MAIN CB SIZE	125A
SURFACE, FLUSH, OR MCC	SURFACE			TOTAL SPACES	28
AIC RATING	18,000				

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
TABLE SAW (MA6) - 125	1740	2	30A	3#10,1#10G,1"C	1	3660		2	3#10,1#10G,1"C	30A	2	1920	SHAPER (MA9) - 125
---	1740				3		3660	4				1920	---
WELDER - 125	2400	2	30A	3#10,1#10G,1"C	5	6600		6	3#6,1#10G,1"C	50A	2	4200	WELDER - 125
---	2400				7		6600	8				4200	---
					9	0		10					
					11		0	12					
					13	0		14					
					15		0	16					
SPARE		1	20A		17	0		18		20A	1		SPARE
SPARE		1	20A		19		0	20		20A	1		SPARE
SPARE		2	20A		21	0		22		20A	1		SPARE
---					23		0	24					---
SPARE		2	20A		25	0		26		20A	1		SPARE
---					27		0	28					---
TOTAL VOLT-AMPERES PER PHASE						10260	10260						
TOTAL AMPERES PER PHASE						85.5	85.5						
**GFI CIRCUIT BREAKER													

PANEL SCHEDULE	MDP			VOLTAGE	480Y/277V, 3-PHASE, 4-WIRE
LOCATION	GSD BLDG - MECHANICAL 109			MAINS AMPACITY	800A
ENCLOSURE	NEMA 1			MAIN CB SIZE	800A
SURFACE, FLUSH, OR MCC	SURFACE			TOTAL SPACES	18
AIC RATING	65,000				

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
PANEL H1 via ATS 1	36897	3	200A		1	36897			2		200A	3		Spare
---	30962			REFER TO E-1-900 RISER	3		30962		4					---
---	33995				5			33995	6					---
PANEL H2 via ATS 2	51850	3	300A		7	51850			8		200A	3		Spare
---	51930			REFER TO E-1-900 RISER	9		51930		10					---
---	34661				11			34661	12					---
Space		3	250A		13	0			14		250A	3		Space
					15		0		16					
					17			0	18					
TOTAL VOLT-AMPERES PER PHASE						88747	82892	68656						
TOTAL AMPERES PER PHASE						320.4	299.2	247.9						

PANEL SCHEDULE	H1			VOLTAGE	480Y/277V, 3-PHASE, 4-WIRE
LOCATION	GSD BLDG - MECHANICAL 109			MAINS AMPACITY	250A
ENCLOSURE	NEMA 1			MAIN CB SIZE	200A
SURFACE, FLUSH, OR MCC	SURFACE			TOTAL SPACES	42
AIC RATING					

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RTU-01	11000	3	50A	3#8,1#10G,1"C	1				2	3#12,1#12G,3/4"C	15A	3	2220	HP-1
---	11000				3				4				2220	---
---	11000				5				6				2220	---
RTU-02	5540	3	25A	3#10,1#10G,1"C	7				8	3#12,1#12G,3/4"C	15A	3	2220	HP-2
---	5540				9				10				2220	---
---	5540				11				12				2220	---
					13				14	2#12,1#12G,3/4"C	15A	1	3300	EH-1 - 109
					15				16	2#12,1#12G,3/4"C	15A	1	3300	EH-1 - 117
					17				18	2#12,1#12G,3/4"C	15A	1	3300	EH-1 - 124
					19				20	2#12,1#12G,3/4"C	20A	1	2712	LIGHTS - 101-106
					21				22	2#12,1#12G,3/4"C	20A	1	360	LIGHTS - BLDG A/B
LIGHTS - 107	3960	1	20A	2#12,1#12G,3/4"C	23				24	2#12,1#12G,3/4"C	20A	1	384	LIGHTS - BLDG C
LIGHTS - 109-122	1841	1	20A	2#12,1#12G,3/4"C	25				26	2#12,1#12G,3/4"C	20A	1	2680	LIGHTS - 123-125
LIGHTS - PARKING LOT	581	1	20A	2#12,1#12G,3/4"C	27				28	2#10,1#10G,1"C	20A	1	715	LIGHTS - PARKING LOT
LIGHTS - PARKING LOT	393	1	20A	2#12,1#12G,3/4"C	29				30	2#12,1#12G,3/4"C	20A	1	152	LIGHTS - PARKING LOT
LIGHTING CONTROL	500	1	20A	2#12,1#12G,3/4"C	31				32					
SPARE		1	20A		33				34		20A	1		SPARE
SPARE		1	20A		35				36		20A	1		SPARE
PANEL L1 via Xfrm	4354	3	70A	REFER TO E-1-900 RISER	37				38		20A	1		SPARE
-	4876				39				40		20A	1		SPARE
-	4826				41				42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE														
TOTAL AMPERES PER PHASE														
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	H2			VOLTAGE	480Y/277V, 3-PHASE, 4-WIRE
LOCATION	GSD BLDG - MECHANICAL 109			MAINS AMPACITY	400A
ENCLOSURE	NEMA 1			MAIN CB SIZE	300A
SURFACE, FLUSH, OR MCC	SURFACE			TOTAL SPACES	42
AIC RATING					

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
PANEL L2A via Xfrm	7760	3	110A	REFER TO E-1-900 RISER	1	11160			2	3#10,1#10G,1"C	25A	3	3400	Air Compressor - 125
---	10100				3		13500		4				3400	---
---	8080				5			11480	6				3400	---
PANEL L2B via Xfrm	9120	3	110A	REFER TO E-1-900 RISER	7	10230			8	3#12,1#12G,3/4"C	15A	3	1110	EF-06 - 125
---	8040				9		9150		10				1110	---
---	8400				11			9510	12				1110	---
PANEL L2C via Xfrm	11560	3	110A	REFER TO E-1-900 RISER	13	12160			14	3#12,1#12G,3/4"C	15A	3	600	REACH TRUCK CHARGER - 107
---	10460				15		11060		16				600	---
---	8475				17			9075	18				600	---
PANEL L2D via Xfrm	7540	3	70A	REFER TO E-1-900 RISER	19	8040			20	3#12,1#12G,3/4"C	15A	3	500	VES - 126
---	7460				21		7960		22				500	---
---	4096				23			4596	24				500	---
					25	0			26					
					27		0		28					
					29			0	30					
					31	0			32					
					33		0		34					
					35			0	36					
PANEL L2MA via Xfrm	10260	2	100A	REFER TO E-1-900 RISER	37	10260			38					
---	10260				39		10260		40					
					41			0	42					
TOTAL VOLT-AMPERES PER PHASE						51850	51930	34661						
TOTAL AMPERES PER PHASE						187.2	187.5	125.1						
**GFI CIRCUIT BREAKER														

REVISION NUMBER	REVISIONS	DATE	BY

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a division of GRW

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PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL SCHEDULES
PANEL SCHEDULES II

PATRICK JAYE BAILEY
REGISTERED
22977
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-602	△

PANEL SCHEDULE	L3				VOLTAGE		120/240V, 1-PHASE, 3-WIRE					
LOCATION	BULK STORAGE BLDG				MAINS AMPACITY		100A					
ENCLOSURE	NEMA 3R				MAIN CB SIZE		50A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		28					
AIC RATING	65,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
LIGHTS - BULK STORAGE	321	1	20A	2#12,1#12G,3/4"C	1	861		2	2#12,1#12G,3/4"C	20A	1	540	RECEPT - BULK STORAGE
LIGHTS - OPEN STORAGE	1284	1	20A	2#12,1#12G,3/4"C	3		2364	4	2#12,1#12G,3/4"C	20A	1	1080	RECEPT - OPEN STORAGE
LIGHTS - OPEN STORAGE	120	1	20A	2#12,1#12G,3/4"C	5	420		6	2#12,1#12G,3/4"C	20A	1	300	LIGHTING CONTROL
FUEL PUMP	660	1	15A	2#12,1#12G,3/4"C	7		1320	8	2#12,1#12G,3/4"C	15A	1	660	FUEL PUMP
SHUNT TRIP					9	0		10					SHUNT TRIP
					11		0	12					
					13	0		14					
					15		0	16					
					17	0		18					
					19		0	20					
					21	0		22					
SPARE		1	20A		23		0	24		20A	1		SPARE
SPARE		1	20A		25	0		26		20A	1		SPARE
SPARE		1	20A		27		0	28		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						1281	3684						
TOTAL AMPERES PER PHASE						10.7	30.7						
**GFI CIRCUIT BREAKER													

PANEL SCHEDULE	L4A				VOLTAGE		208Y/120V, 3-PHASE, 4-WIRE					
LOCATION	MAIL ROOM BLDG - ELECTRICAL 104				MAINS AMPACITY		400A					
ENCLOSURE	NEMA 1				MAIN CB SIZE		400A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		42					
AIC RATING	65,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RTU-03	12800	3	60A	3#6,1#10G,1"C	1	12980			2	2#12,1#12G,3/4"C	15A	1	180	EF-08
---	12800				3		12800		4					
---	12800				5			14450	6	2#12,1#12G,3/4"C	20A	2	1650	EH-02
WATER HEATER - 103	600	1	20A	2#12,1#12G,3/4"C	7	2250			8				1650	---
PP-3-1 - 103	500	1	20A	2#12,1#12G,3/4"C	9		1000		10	2#12,1#12G,3/4"C	20A	1	500	DDC PANEL - 103
RECEPT - 104	1200	1	20A	2#12,1#12G,3/4"C	11			2400	12	2#12,1#12G,3/4"C	20A	1	1200	RECEPT - 104
ACCESS CONTROL - 104	1000	1	20A	2#12,1#12G,3/4"C	13	2200			14	2#12,1#12G,3/4"C	20A	1	1200	COPIER - 102
RECEPT - 102, 105-107	900	1	20A	2#12,1#12G,3/4"C	15		1400		16	2#12,1#12G,3/4"C	20A	1	500	REFRIGERATOR - 108
MICROWAVE - 108	1200	1	20A	2#12,1#12G,3/4"C	17			1900	18	2#12,1#12G,3/4"C	20A	1	700	DISPOSAL - 108
RECEPT - 108	900	1	20A	2#12,1#12G,3/4"C	19	1620			20	2#12,1#12G,3/4"C	20A	1	720	RECEPT - 108
RECEPT - 109	1080	1	20A	2#12,1#12G,3/4"C	21		1680		22	2#12,1#12G,3/4"C	20A	1	600	COMPUTER - 109
COMPUTER - 109	600	1	20A	2#12,1#12G,3/4"C	23			1200	24	2#12,1#12G,3/4"C	20A	1	600	COMPUTER - 102
COMPUTER - 102	1200	1	20A	2#12,1#12G,3/4"C	25	2100			26	2#12,1#12G,3/4"C	20A	1	900	RECEPT - 102, 110
BIO SAFETY CABINET - 110	1800	1	20A	2#12,1#12G,3/4"C	27		3000		28	2#12,1#12G,3/4"C	20A	1	1200	STRAP MACHINE - 110
PARCEL METERING - 102	1200	1	20A	2#12,1#12G,3/4"C	29			2280	30	2#12,1#12G,3/4"C	20A	1	1080	RECEPT - 101, 102, 110
SPARE		1	20A		31	0			32		20A	1		SPARE
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
Panel L4B	1747	3	200A		37	1747			38		20A	1		SPARE
---	3400				39		3400		40		20A	1		SPARE
---	3726				41			3726	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						22897	23280	25956						
TOTAL AMPERES PER PHASE						190.8	194	216.3						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L4B				VOLTAGE		208Y/120V, 3-PHASE, 4-WIRE					
LOCATION	MAIL ROOM BLDG - ELECTRICAL 104				MAINS AMPACITY		200A					
ENCLOSURE	NEMA 1				MAIN CB SIZE		200A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		42					
AIC RATING	65,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	-C- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RECEPT - 102	900	1	20A	2#12,1#12G,3/4"C	1	1440			2	2#12,1#12G,3/4"C	20A	1	540	RECEPT - 102
STAMPING MACHINE - 102	1200	1	20A	2#12,1#12G,3/4"C	3		2400		4	2#12,1#12G,3/4"C	20A	1	1200	STAMPING MACHINE - 102
STAMPING MACHINE - 102	1200	1	20A	2#12,1#12G,3/4"C	5			2346	6	2#12,1#12G,3/4"C	20A	1	1146	LIGHTS
EXT BLDG LTS	144	1	20A	2#12,1#12G,3/4"C	7	307			8	2#12,1#12G,3/4"C	20A	1	163	POLE LIGHTS
FIRE ALARM - 104	500	1	20A	2#12,1#12G,3/4"C	9		1000		10	2#12,1#12G,3/4"C	20A	1	500	FIRE ALARM - 104
LIGHTING CONTACTOR	300	1	20A	2#12,1#12G,3/4"C	11			1380	12	2#12,1#12G,3/4"C	20A	1	1080	RECEPT 102-105
					13	0			14					
					15		0		16					
					17			0	18					
					19	0			20					
					21		0		22					
					23			0	24					
					25	0			26					
					27		0		28					
					29			0	30					
SPARE		1	20A		31	0			32		20A	1		SPARE
SPARE		1	20A		33		0		34		20A	1		SPARE
SPARE		1	20A		35			0	36		20A	1		SPARE
SPARE		1	20A		37	0			38		20A	1		SPARE
SPARE		1	20A		39		0		40		20A	1		SPARE
SPARE		1	20A		41			0	42		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						1747	3400	3726						
TOTAL AMPERES PER PHASE						14.6	28.3	31.1						
**GFI CIRCUIT BREAKER														

PANEL SCHEDULE	L5				VOLTAGE		120/240V, 1-PHASE, 3-WIRE					
LOCATION	VEHICLE STORAGE BLDG				MAINS AMPACITY		100A					
ENCLOSURE	NEMA 3R				MAIN CB SIZE		50A					
SURFACE, FLUSH, OR MCC	SURFACE				TOTAL SPACES		16					
AIC RATING	65,000											

DESCRIPTION	VA	#P	BKR	FEEDER	NO	-A- VA	-B- VA	NO.	FEEDER	BKR	#P	VA	DESCRIPTION
RECEPT - VEHICLE STORAGE	360	1	20A	2#12,1#12G,3/4"C	1	720		2	2#12,1#12G,3/4"C	20A	1	360	RECEPT - VEHICLE STORAGE
RECEPT - VEHICLE PARKING	360	1	20A	2#12,1#12G,3/4"C	3		720	4	2#12,1#12G,3/4"C	20A	1	360	RECEPT - VEHICLE PARKING
RECEPT - VEHICLE PARKING	360	1	20A	2#12,1#12G,3/4"C	5	720		6	2#12,1#12G,3/4"C	20A	1	360	RECEPT - VEHICLE PARKING
RECEPT - VEHICLE PARKING	360	1	20A	2#12,1#12G,3/4"C	7		720	8	2#12,1#12G,3/4"C	20A	1	360	RECEPT - VEHICLE PARKING
					9	0		10					
SPARE		1	20A		11		0	12		20A	1		SPARE
SPARE		1	20A		13	0		14		20A	1		SPARE
SPARE		1	20A		15		0	16		20A	1		SPARE
TOTAL VOLT-AMPERES PER PHASE						1440	1440						
TOTAL AMPERES PER PHASE						12	12						
**GFI CIRCUIT BREAKER													

REVISION NUMBER	REVISIONS	DATE	BY

Chapman Technical Group
a division of GRW

AIRPORT PLANNING / DEVELOPMENT
ARCHITECTURE / INTERIOR DESIGN
CIVIL ENGINEERING / SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
LANDSCAPE ARCHITECTURE
SURVEYING

St. Albans, WV
(304) 727-5501

Buckhannon, WV
(304) 472-8914

www.chaptech.com

PROJECT INFORMATION
West Virginia Department of Administration
General Services Division
Capitol East Campus
Charleston, West Virginia

ELECTRICAL SCHEDULES
PANEL SCHEDULES III

PATRICK JAYE BAILEY
REGISTERED
022177
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
8-6-21

JOB NUMBER:	19027
SCALE:	AS NOTED
DATE:	AUGUST 6, 2021
DRAWN BY:	KGM
DESIGNED BY:	KGM
CHECKED BY:	PJB
SHEET NO.	REVISION
E-603	

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Terracon GeoReport

Geotechnical Engineering Report

East End Building

Charleston, West Virginia

July 23, 2020

Terracon Project No. N2195065

Prepared for:

Chapman Technical Group

Saint Albans, West Virginia

Prepared by:

Terracon Consultants, Inc.

Charleston, West Virginia

terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

July 23, 2020

Chapman Technical Group
200 6th Avenue
Saint Albans, West Virginia 25177

Attn: Mr. Joseph Bird
P: 304-727-5501

Re: Geotechnical Engineering Report
East End Building
Washington Street E
Charleston, West Virginia
Terracon Project No. N2195065

Dear Mr. Bird:

We have completed the Geotechnical Engineering Services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PN2195065 dated August 27, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

FOR

Alexandra B. Sovine, E.I.
Staff Engineer

Michael A. Fioravante, P.E.
Geotechnical Department Manager

Reviewed by: Kevin M. Ernst, P.E., Principal

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS (Boring Logs and Laboratory Data)
SUPPORTING INFORMATION (General Notes and Unified Soil Classification System)

Geotechnical Engineering Report
East End Building
Washington Street E
Charleston, West Virginia
Terracon Project No. N2195065
July 23, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed East End Building and pavement areas located at Washington Street E and Virginia Terrace in Charleston, West Virginia. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Pavement construction

The geotechnical engineering scope of services for this project included the advancement of six (6) test borings. Three (3) borings, designated as B-1 through B-3, were located in the proposed building footprint and advanced to depths of approximately 58 to 65.1 feet below existing site grades. The three (3) remaining borings, designated as B-4 through B-6, were located in the various parking areas and advanced to a depth of approximately 11.5 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at the east end of Charleston, Kanawha County, West Virginia. The approximate coordinates of the site location are Latitude 38.3376001, Longitude -81.6086985. See **Site Location Plan**
Existing Improvements	The proposed building is located north of Virginia Terrace in an existing DOH storage lot. The proposed pavement areas are located in existing empty lots east of Michigan Avenue and east of Jefferson Street.
Current Ground Cover	Gravel lots, storage buildings and parking areas
Existing Topography	The existing site is relatively level.
Geology	A review of geologic literature indicates that the project site is located within the Quarternary Alluvium group which consists of sand, gravel, silt and clay deposits.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Information was provided by Joseph Bird of Chapman Technical Group on August 14, 2019 and subsequent communication.
Project Description	The project consists of a proposed building and adjacent parking areas.
Finished Floor Elevation	Not provided at report writing.
Maximum Loads	Not Provided. Anticipated light loads due to the type of structure.
Grading/Slopes	Minor grading anticipated
Estimated Start of Construction	Not provided.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

Six (6) geotechnical test borings were extended to depths of approximately 11.5 to 65.1 feet below the existing ground surface. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
Surface	0.2 to 0.5	Gravel, aggregate base	Not applicable
Fill	5 to 15	Poorly graded sand with gravel, silty gravel with sand, silty sand with gravel, lean clay, lean clay with sand	Not applicable
Native Cohesive Soils [1, 2]	11.5 to 55	Lean clay, lean clay with sand, sandy lean clay, sandy lean clay with gravel, silty clay, sandy silty clay	Very soft to very stiff
Native Granular Soils[2]	35 to 48	Clayey sand, silty sand, silty sand with gravel	Loose to very dense
Bedrock	Undetermined	Sandstone, shale, silty shale, claystone	Weak to medium strong

1. Borings B-4, B-5, and B-6 were terminated in this stratum
2. Borings B-1, B-2, and B-3 encountered alternating layers of native cohesive and native granular soils above bedrock

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was encountered at various depths across the site ranging from approximately 2.5 to 26 feet below the existing ground surface. Groundwater was not encountered in boring B-4.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, river level and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

The test borings performed for this project site encountered fill material generally comprised of poorly graded sand with gravel, lean clay with sand, lean clay, silty gravel with sand, and silty sand with gravel to approximate depths ranging from 5 to 15 feet below the existing ground surface. This fill material was underlain by alternating layers of native cohesive soils which generally consisted of very soft to very stiff lean clay with varying amounts of sand, silt and gravel and loose to very dense sand with varying amounts of clay, silt and gravel. These native soils were underlain by alternating layers of slightly to moderately weathered, weak to medium strong sandstone and shale. Bedrock was encountered at depths ranging from approximately 40 to 55 feet below the existing ground surface in Borings B-1, B-2, and B-3. Borings B-4, B-5, and B-6 were terminated in native cohesive soil and did not encounter any native granular soils.

Information concerning the construction of the fill, such as method of placement and compaction was not available, thus the fill is considered to be an undocumented fill. Foundations and floor slabs supported on man-placed, undocumented or uncontrolled fill have inherent risk of differential settlement due to the variability in composition and quality of the fill. This settlement response can create distress (e.g., cracking) in foundations, floor slabs and other elements of the building structure.

Due to the potential for adverse settlement response of the deep undocumented fill, we do not recommend that the building be supported on shallow foundations. The building can be supported on a deep foundation system consisting of either drilled shafts or auger-cast piles bearing within competent soils consisting of at least medium dense sand or very stiff clay; or bedrock. Based on the borings B-1, B-2 and B-3 the competent soil stratum was first encountered at depths varying from about 30 to 35 feet below the existing ground surface. Shafts or auger-cast piles extended into bedrock can be designed to achieve high capacities.

Provided the owner is willing to accept the risk associated with construction on undocumented fill, the floor slab can be designed as a slab-on-grade floor provided the earthwork recommendations presented in this report are followed. In this case, the earthwork for the floor slab preparation includes undercutting a minimum of 3 feet of the undocumented fill within the building footprint and 10 feet beyond the footprint. We then recommend that the undercut excavation be backfilled with engineered fill to establish floor slab subgrade elevation. In lieu of an undercut and replacement scheme for a slab-on-grade, a structural slab can be used. The structural slab provides the least risk for potential distress to slab due to the uncontrolled fill. Foundation design recommendations for drilled shafts or auger-cast piles to support the proposed building are presented in the **Deep Foundations** section.

Groundwater was encountered at various depths across the site ranging from approximately 2.5 to 26 feet below the existing ground surface. Groundwater levels fluctuate over time and should be

evaluated at the time of construction. In our experience, seepage from perched zones in shallow excavations above the groundwater table can generally be controlled by sump and pump methods; however, seepage and groundwater infiltration into excavation below the groundwater table will need more robust dewatering measures. Groundwater should be lowered to a depth of at least 2 feet below the proposed bottom of excavations. The contractor is responsible for employing appropriate dewatering methods to control seepage and facilitate construction.

The 2012 International Building Code (IBC) seismic site classification for this site is D.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork will include clearing and grubbing, excavations and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations and floor slabs.

Site Preparation

As an initial measure of site preparation, any vegetation and root mats or any deleterious material (e.g. existing pavement, debris, desiccated soil, frozen soil, etc.) should be completely stripped to expose the underlying soil subgrade within and at least 5 feet beyond areas that will receive fill or support the proposed addition. Stripped materials consisting of vegetation and organic materials, if encountered, should be wasted off site, or used to vegetate landscaped areas after completion of grading operations. Stripping depths between our boring locations and across the site could vary considerably. We recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material.

Removal and/or relocation of any “to be abandoned” utilities, should be performed prior to rough site grading activities. We would anticipate removal and relocation, or re-routing, of any existing utilities which currently exist within the footprint of the proposed development area that would interfere with new construction. Any abandoned underground pipes left in place should be fully grouted. Excavations created due to utility relocations or removal should be backfilled with engineered fill material, placed and compacted in accordance with the recommendations provided in the following paragraphs, or with lean concrete or flowable fill. If lean concrete is used as backfill, the contractor should refer to all of the new build Mechanical-Electrical-Plumbing (MEP) and foundation drawings to confirm that the concrete backfill materials will not conflict with any new item installations or construction.

Any remnant foundations or structures from prior site development encountered should be completely removed and the associated excavations backfilled with engineered structural fill.

After completing these operations, and performing undercutting of the existing fill, cohesive soils exposed at the bottom of the excavation subgrade should be thoroughly proofrolled (under the observation of Terracon personnel) with a loaded tandem-axle dump truck or other heavy, rubber-tired construction equipment weighing at least 20 tons to locate any zones that are soft or unstable. Exposed granular soils should be proofrolled with a heavy vibratory roller having at least 8 tons load on the drum. Proofrolling aids in providing a firm base for compaction of fill and helps delineate soft or disturbed areas. Areas where soft, low density, wet, dry or otherwise unsuitable materials are located should be repaired by scarification/moisture conditioning/compaction or by removing and replacing the materials with controlled structural fill.

The exposed subgrade where excessive rutting or pumping occurs during proofrolling should be removed and replaced or aerated/reworked and recompacted in place to our recommendations for engineered fill. Other structural areas should be backfilled with engineered fill conforming to the material and compaction recommendations in this report.

Fill Material Types

Engineered fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Lean clay [2]	CL (LL<40)	All locations and elevations.
Well graded granular	SW, GW [3]	All locations and elevations.
Low Volume Change Material [4]	CL (LL<40 & 5<PI<20) or SW, GW	All locations and elevations.
On-Site Soils	CL, CL-ML, SM, SC	The native and fill on-site soils generally appear suitable for use as engineered fill; however, any fill placed should meet the low volume change requirements and be free of deleterious materials such as organics, rubble and construction debris. The maximum particle size should be limited to 4 inches to allow for placement of compacted soil lifts. Oversized particles should be culled from the fill. Moisture conditioning of the existing on-site soils may also be required prior to its use as engineered fill. Silt (ML) should not be used as engineered fill within 2.5 feet of final grades due to frost heave and workability concerns.

Fill Type [1]	USCS Classification	Acceptable Location for Placement

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Delineation of lean clays and fat clays should be performed in the field by a qualified geotechnical engineer or their representative and could require additional laboratory testing. Fat clays should not be used as engineered fill.
3. Crushed limestone aggregate, limestone screenings, or granular material such as sand, gravel or crushed stone.
4. Low volume change cohesive soil or granular soil.

Fill Compaction Requirements

Engineered fill should meet the following compaction requirements:

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used or 4 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
Compaction Requirements [1,3]	Minimum 98% of the material's maximum standard Proctor dry density (ASTM D698).
Moisture Content of Cohesive Soils (Low Plasticity)	Within -2% to +3% of the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Moisture Content of Granular Material [2]	Workable moisture levels

1. The moisture content and compaction should be measured for each lift of engineered fill during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved. The zone of fill compacted to meet this criteria should extend at least 5 feet horizontally beyond the structure footprint.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.
3. All materials to be used as engineered fill should be tested in the laboratory to determine their suitability and compaction characteristics.

Utility Trench Backfill

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the structures should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the structure. We recommend constructing an effective "trench plug" that extends at least 5 feet out from the face of the structure exterior. The plug material should consist of cementitious "flowable fill" or impervious clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the moisture content and compaction recommendations for areal fill stated previously in this report.

Compaction requirements for bedding and backfilling around utilities may need to be adjusted to the pipe material type and the pipe manufacturer's bedding and backfill material recommendations. If utility trenches in unpaved areas are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Grading and Drainage

All grades must provide effective drainage away from the structure during and after construction. Water permitted to pond next to the building addition can result in greater soil movements than those discussed in this report. These greater movements can result in unacceptable differential movements, cracked slabs, and roof leaks. Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the structure.

Exposed ground should be sloped and maintained at a minimum 10 percent away from the structures for at least 10 feet beyond the perimeter. After structure construction and landscaping, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, we recommend a maintenance program to effectively seal and maintain joints to prevent surface water infiltration.

Earthwork Construction Considerations

It is anticipated that shallow excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of foundations. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations.

If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to foundation construction and observed by Terracon.

Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the structure areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, state, and federal safety regulations. The contractor should be aware that slope height, slope inclination, and excavation depth should in no instance exceed those specified by these safety regulations. Flatter slopes than those dictated by these regulations may be required depending upon the soil conditions encountered and other external factors. These regulations are strictly enforced and if they are not followed, the owner, contractor, and/or earthwork and utility subcontractor could be liable and subject to substantial penalties.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proofrolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of structure foundations.

FLOOR SLABS

Design parameters for floor slabs of the proposed building structure assume that the requirements for **Site Preparation** have been followed. Specific attention should be given to positive drainage away from the structure. This also includes the positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor slab support [1]	Minimum 18-inch low volume change zone and special subgrade preparation is required
Estimated modulus of subgrade reaction	110 pounds per square inch per inch (psi/in) for point loading conditions
Aggregate base course/capillary break [2]	Minimum 4 inches of free draining granular material

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movement between the slab and foundation. Narrower, turned-down slab-on-grade foundations may be utilized at the approval of the structural engineer. The slabs should be appropriately reinforced to support the proposed loads. We recommend subgrades be maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become desiccated prior to construction of floor slabs, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density until construction of the building floor slabs.
2. The floor slab design should include a capillary break, comprised of free-draining, compacted, granular material at least 4 inches thick and can be considered as part of the low volume change zone. Free-draining granular material should have less than 5 percent fines (material passing the #200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Floor Slab Construction Considerations

Finished subgrade within and for at least 10 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and engineered fill should be added to replace the

resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

DEEP FOUNDATIONS

Drilled Shaft Foundations

We understand that the proposed building may be supported on drilled shaft foundation elements. We recommend a minimum shaft diameter of 24 inches. Based on our subsurface findings at this project site, it is recommended that the drilled shafts should bear within the competent soil stratum was first encountered at depths varying from about 30 to 35 feet below the existing ground surface, or bedrock. The following table provides the approximate top of the competent soil statum and the top of bedrock based on borings B-1, B-2 and B-3 drilled for project.

Boring No.	Approximate Top of Competent Soil Statum (feet - below existing ground surface)	Approximate Top of Bedrock (feet - below existing ground surface)
B-1	30	40
B-2	35	55
B-3	31	40

To achieve reliable end bearing capacity, drill shafts should be extended at least 2 shaft diameters into the competent soil stratum. Shafts designed to bear within bedrock should be extended at least 1 shaft diameter into the bedrock stratum.

It is recommended that the drilled shaft design should incorporate a factor of safety of 3.0 for end bearing and 2.5 for side resistance, respectively, when subjected to axial compression. A factor of safety of 3.0 is recommended for side resistance against uplift.

Soil and rock parameters for lateral design are presented below.

Drilled Shaft Construction Considerations

The following construction considerations during drilled shaft installation should be followed:

- It is anticipated that drilled shafts will need to be constructed by using the slurry-displacement method (due to the presence of groundwater and granular soils). Temporary casing should be made available during the drilled shaft construction process. If casing is permanently left in place due to soil and groundwater conditions, the annulus between the casing and the surrounding soil should be pressure grouted.

- The actual bearing elevation at each drilled shaft location should be determined in the field during construction through inspection by an authorized representative of the geotechnical engineer.

- If effective dewatering is not practical, concrete should be placed at the bottom of the excavation by pumping or by using a tremie pipe.

- To facilitate the drilled shaft construction, concrete should be on-site and ready for placement as pier excavations are completed.

- It is recommended that no completed drilled shaft holes be left open overnight without being filled with concrete.

The drilled shaft installation process should be performed under the direction of the Geotechnical Engineer. The Geotechnical Engineer should document the shaft installation process including soil/rock and groundwater conditions encountered, consistency with expected conditions, and details of the installed shaft.

Soil and Rock Parameters for Axial Design of Drilled Shafts

Soil and rock parameters for analysis and design of drilled shafts to support axial loading using the computer program SHAFT (version 2012) for all borings have been developed. Parameters provided below do not include factors for safety. Factor of safety values recommended in the previous section should be incorporated in the drilled shaft design. Detail are presented below.
As indicated before, if the new fill is placed after construction of the drilled shafts, negative skin friction will cause downdrag forces on the shafts. The downdrag forces generally act to a depth of about 70 percent of the overburden depth. Therefore, we recommend that downdrag forces to this depth be considered in the design of the drilled shafts.

Test Boring Number: B-1

Soil Layer Number	Soil Type	Depth to Bottom of Layer[1] (feet)	Total Unit Weight (pcf)	Un-drained Shear Strength (psf)	Adhesion Factor	Friction Angle (degrees)	Horizontal Stress Coefficient	Bearing Capacity Factor N_c	Bearing Capacity Factor N_q
1[2]	Sand (Fill modeled as sand)	5	110	--	--	28	0.40	--	--
2	Clay (Fill modeled as clay)	10	122	250	0.55	--	--	--	--
3	Clay	17.5	125	1,000	0.55	--	--	--	--
4	Clay	25	122	250	0.55	--	--	--	--
5	Clay	30	123	500	0.55	--	--	--	--
6	Sand	35	132	--	--	37	0.52	--	102
7	Clay	40	131	4,000	0.51	--	--	7.0	--
8	Sand (Gravel modeled as sand)	40	132	--	--	37	0.52	--	102
9	Weak rock (Shale)	60.7	145	Design parameters for rock are tabulated below.					
10	Strong rock (Sandstone)	65	150	Design parameters for rock are tabulated below.					

Groundwater encountered at 2.5 feet while drilling.

Rock Type	Depth to Bottom of Layer[1,3] (feet)	Rock Compressive Strength (psi)	Elastic Modulus (psi)	Discontinuity Spacing (feet)	Discontinuity Thickness (feet)	RQD (%)
Weak rock (Shale)	60.7	984	3,500	2	0.1	88
Strong rock (Sandstone)	65	1,000	15,000	2	0.1	52

Test Boring Number: B-2

Soil Layer Number	Soil Type	Depth to Bottom of Layer[1] (feet)	Total Unit Weight (pcf)	Un-drained Shear Strength (psf)	Adhesion Factor	Friction Angle (degrees)	Horizontal Stress Coefficient	Bearing Capacity Factor N_c	Bearing Capacity Factor N_q
1[2]	Clay (Fill modeled as clay)	5	122	250	0.55	--	--	--	--
2	Clay	25	124	750	0.55	--	--	--	--
3	Sand	30	113	--	--	29	0.41	--	--
4	Sand	35	115	--	--	30	0.43	--	--
5	Sand	45	127	--	--	35	0.48	--	74
6	Clay	50	130	3,000	0.55	--	--	7.0	--
7	Clay	55	128	2,000	0.55	--	--	7.0	--
8	Weak rock (Claystone)	56.1	140	Design parameters for rock are tabulated below.					
9	Weak rock (Shale)	57.8	145	Design parameters for rock are tabulated below.					
10	Strong rock (Sandstone)	65.1	150	Design parameters for rock are tabulated below.					

Groundwater encountered at 3 feet while drilling.

Rock Type	Depth to Bottom of Layer[1,3] (feet)	Rock Compressive Strength (psi)	Elastic Modulus (psi)	Discontinuity Spacing (feet)	Discontinuity Thickness (feet)	RQD (%)
Weak rock (Claystone)	57.8	150	150	2	0.1	43
Weak rock (Shale)	57.8	2,534	1,200	2	0.1	43
Strong rock (Sandstone)	65.1	1,000	17,500	2	0.1	58.5

Test Boring Number: B-3

Soil Layer Number	Soil Type	Depth to Bottom of Layer[1] (feet)	Total Unit Weight (pcf)	Un-drained Shear Strength (psf)	Adhesion Factor	Friction Angle (degrees)	Horizontal Stress Coefficient	Bearing Capacity Factor N_c	Bearing Capacity Factor N_q
1[2]	Clay (Fill modeled as clay)	15	122	250	0.55	--	--	--	--
2	Clay	20	123	500	0.55	--	--	--	--
3	Clay	25	122	250	0.55	--	--	--	--
4	Clay	31	123	500	0.55	--	--	--	--
5	Sand	35	123	--	--	33	0.46	--	52
6	Sand	40	115	--	--	30	0.43	--	37
7	Sand	45.5	118	--	--	31	0.44	--	37
8	Sand	48	132	--	--	37	0.52	--	102
9	Weak rock (Shale)	53.3	145	Design parameters for rock are tabulated below.					
10	Strong rock (Sandstone)	58	150	Design parameters for rock are tabulated below.					

Groundwater encountered at 26 feet while drilling.

Rock Type	Depth to Bottom of Layer[1,3] (feet)	Rock Compressive Strength (psi)	Elastic Modulus (psi)	Discontinuity Spacing (feet)	Discontinuity Thickness (feet)	RQD (%)
Weak rock (Shale)	53.3	1,000	1,700	2	0.1	57
Strong rock (Sandstone)	58	4,475	100,000	2	0.1	67

Notes:

1. Depth referenced to existing ground surface.
2. The side resistance of the uppermost 2 feet of the soil should be ignored due to the potential for disturbance caused during the drilled shaft construction operation.
3. Rock coring may be required to achieve the minimum length of drill shafts during shaft installation.

Soil and Rock Parameters and Models for Lateral Load Analyses of Drilled Shafts

Soil and rock parameters for detailed lateral load analyses of drilled shaft foundation using the computer program LPILE (version 2012.6.37) have also been developed. Details are presented below.

Test Boring Number: B-1

Soil Layer Number	Soil Model	Depth to Top of Soil Layer[1] (feet)	Depth to Bottom of Soil Layer (feet)	Effective Unit Weight (pcf)	Friction Angle (degrees)	k value (pci)	Un-drained cohesion (psf)	Strain Factor (ε50)
1[2]	Sand (Fill modeled as sand)	0	5	48	28	20	--	--
2	Clay (Fill modeled as clay)	5	10	60	--	20	250	0.025
3	Clay	10	17.5	63		300	1,000	0.012
4	Clay	17.5	25	60	--	20	250	0.025
5	Clay	25	30	60	--	75	500	0.020
6	Sand	30	35	70	37	135	--	--
7	Clay	35	40	69	--	1,500	4,000	0.004
8	Sand (Gravel modeled as sand)	40	55	132	37	135	--	--
10	Weak rock (Shale)	55	60.7	145	Design parameters for rock are tabulated below.			
11	Strong rock (Sandstone)	60.7	65	150	Design parameters for rock are tabulated below.			

Groundwater encountered at 2.5 feet while drilling.

Rock Type	Depth to Bottom of Layer[1] (feet)	Effective Unit Weight (pcf)	Initial Modulus of Rock Mass (psi)	RQD (%)	Uniaxial Compressive Strength (psi)	Strain Factor (k_{rm})
Weak rock (Shale)	60.7	145	3,500	88	984	--
Strong rock (Sandstone)	65	150	15,000	52	1,000	--

Test Boring Number: B-2

Soil Layer Number	Soil Model	Depth to Top of Soil Layer[1] (feet)	Depth to Bottom of Soil Layer (feet)	Effective Unit Weight (pcf)	Friction Angle (degrees)	k value (pci)	Un-drained cohesion (psf)	Strain Factor (ε50)
1[2]	Clay (Fill modeled as clay)	0	5	60	--	20	250	0.025
2	Clay	5	25	62	--	100	750	0.015
3	Sand	25	30	51	29	35	--	--
4	Sand	30	35	53	30	50	--	--
5	Sand	35	45	65	35	100	--	--
6	Clay	45	50	68	--	1,000	3,000	0.005
7	Clay	50	55	66	--	800	2,000	0.008
8	Weak rock (Claystone)	55	56.1	140	Design parameters for rock are tabulated below.			
9	Weak rock (Shale)	56.1	57.8	145	Design parameters for rock are tabulated below.			
10	Strong rock (Sandstone)	57.8	65.1	150	Design parameters for rock are tabulated below.			

Groundwater encountered at 3 feet while drilling.

Rock Type	Depth to Bottom of Layer[1] (feet)	Effective Unit Weight (pcf)	Initial Modulus of Rock Mass (psi)	RQD (%)	Uniaxial Compressive Strength (psi)	Strain Factor (k_{rm})
Weak rock (Claystone)	57.8	140	150	43	150	--
Weak rock (Shale)	57.8	145	1,200	43	2,534	--
Strong rock (Sandstone)	65.1	150	17,500	58.5	1,000	--

Test Boring Number: B-3

Soil Layer Number	Soil Model	Depth to Top of Soil Layer[1] (feet)	Depth to Bottom of Soil Layer (feet)	Effective Unit Weight (pcf)	Friction Angle (degrees)	k value (pci)	Un-drained cohesion (psf)	Strain Factor (ε50)
1[2]	Clay (Fill modeled as clay)	0	15	60	--	20	250	0.025
2	Clay	15	20	61	--	75	500	0.020
3	Clay	20	25	60	--	20	250	0.025
4	Clay	25	31	61	--	75	500	0.020
5	Sand	31	35	61	33	80	--	--
6	Sand	35	40	53	30	50	--	--
7	Sand	40	45.5	56	31	60	--	--
8	Sand	45.5	48	70	37	135	--	--
9	Weak rock (Shale)	48	53.3	145	Design parameters for rock are tabulated below.			
10	Strong rock (Sandstone)	53.3	58	150	Design parameters for rock are tabulated below.			

Groundwater encountered at 3 feet while drilling.

Rock Type	Depth to Bottom of Layer[1] (feet)	Effective Unit Weight (pcf)	Initial Modulus of Rock Mass (psi)	RQD (%)	Uniaxial Compressive Strength (psi)	Strain Factor (k_{rm})
Weak rock (Shale)	53.3	145	1,700	57	1,000	--
Weak rock (Sandstone)	58	150	100,000	67	4,475	--

Notes:

1. Depth referenced to existing ground surface.
2. The side resistance of the uppermost 3 feet of the soil should be ignored due to the potential for disturbance caused during the drilled shaft construction operation

Auger Cast Pile Foundations

Recommendations for the design and construction of Auger Cast Pile (ACIP) piles are provided in the following paragraphs.

We recommend that the ACIP be extended to bear in native granular soil of at least dense relative density, native cohesive soil of at least stiff consistency, or on bedrock at or below about elevation 572 feet. We recommend that the following criteria be used in the design of the ACIP foundation system.

- We have evaluated 16 and 18-inch diameter auger cast piles for capacity. The table below depicts the ACIP diameters, maximum pile tip elevations, allowable compressive capacities and uplift capacities.

Pile Diameter (in)	Maximum Pile Tip Elevation (ft)[1]	Compressive Capacity (kips)	Uplift Capacity (kips)
16	568	35	15
	560	45	22
	556	55	29
	551	65	35
	549	75	40
18	572	35	10
	568	45	18
	561	55	24
	558	65	31
	554	75	40
	551	85	44

1. Elevations are estimated and referenced surface elevations obtained from Google Earth

- The International Building Code (IBC) limits compression capacity to 30 percent of the 28-day specified grout compressive strength. We recommend using at least 4,000-psi grout. Using this value and pile diameters listed in the table above, the maximum allowable pile capacity computed using this IBC criterion exceeds the allowable design capacities presented in the table. If additional axial compressive capacity is required, the piles could be extended to Shale bedrock with allowable capacities of 200 kips for a 16-inch diameter pile, or 300 kips for an 18-inch diameter pile. Alternating layers of shale and sandstone bedrock were encountered at estimated elevations of about 545 to 549 feet in Borings B-1, B-2 and B-3.

- The project drawings should indicate the estimated pile tip elevations. The drawings should indicate that these tip elevations are approximate, and variations may occur. However, if variations occur by more than 5 feet, the engineer should be notified immediately for evaluation.

- The specifications should require that the total grout volume in each pile be at least 120 percent of the theoretical “neat” pile volume.

Pile load tests should be performed to confirm pile capacities in accordance with IBC requirements. We are available to assist in determination of the number of pile load tests, loading sequences and locations as the project scope develops.

Auger Cast Pile Construction Considerations

We recommend that the following criteria be used in the construction of the auger cast pile foundation system.

- We recommend that a steel reinforcing bar should be included per structural design requirements, even if lateral load resistance is not required. We recommend that this bar be full-length of the pile and be at least No. 8 bar or larger, centered within the pile. Other reinforcing within the upper section of the pile may also be required for structural considerations.

- Proper installation of ACIPs is highly operator dependent and requires a greater than average dependence on quality workmanship and quality control monitoring. In addition, the successful completion of ACIPs largely depend on the equipment and installation procedures. The auger should be withdrawn in a controlled manner and a sufficient head of grout should always be maintained in the augers, to prevent necking of fluid grout due to hydrostatic pressures.

- If practical drilling refusal is experienced above the anticipated bedrock depth, then a boulder or other obstruction may be present, and a replacement pile should be installed. If this occurs, the situation should be evaluated by the Geotechnical Engineer and the Structural Engineer during the pile driving operations. Continued “hard” drilling to attempt to extend through an obstruction should not be performed, due to the possibility of excessive soil removal.

- The ACIP installation process should be performed under the direction of the Geotechnical Engineer. The Geotechnical Engineer should document the pile installation process including soil/rock and groundwater conditions encountered, consistency with expected conditions, and details of the installed pile.

- Installation of adjacent piles with a clear distance spacing of less than 6 pile diameters should be delayed until grout in the initial pile has set. This is required to avoid possible grout intrusion between the piles, which could jeopardize pile integrity. Piles should be spaced no closer than 3 diameters, center to center.

- A bottom discharge bit should be used (specified) in lieu of a side discharge bit. With this type of bit, centralizers should not be needed for placement of the center bar. The hole in the bottom of the bit should be closed while the auger is advanced. The plug should be removed by the rebar placement prior to grouting.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Pavement Design Parameters

Provided the existing soils and/or new structural fill are tested, evaluated and prepared in accordance with the recommendations provided in this report, these materials should provide suitable pavement support. The subgrade materials within the proposed pavement areas should consist of soils of at least medium stiff consistency or medium dense relative density.

Pavement design criteria were not provided to us; therefore, we have provided typical pavement sections based on our experience with similar projects. The thickness of each course is a function of subgrade strength, traffic, design life, serviceability factors, and frost susceptibility. The recommended minimum pavement sections offered in this report have been based on the following design assumptions:

- 11,279 18-kip Equivalent Single Axle Loads (ESALs) for light-duty parking areas (1.54 ESALS per day)
- 30,576 18-kip Equivalent Single Axle Loads (ESALs) for heavy-duty driveways and truck access lanes (4.20 ESALs per day)
- Design life of 20 years
- Subgrade soils have a minimum CBR value of 3. It is recommended that this CBR value be confirmed prior to construction of the pavement.

Based on these design assumptions, the pavement sections listed on the following table are recommended minimum thicknesses.

Pavement Section Thickness (inches)						
Traffic Area	**Alternative**	**Asphalt Concrete Surface Course**	**Asphalt Concrete Base Course**	**Portland Cement Concrete [1]**	**Aggregate Base Course [2]**	**Total Thickness**
Light Duty (Car Parking)	PCC	--	--	5.0	4.0	9.0
	AC	1.5	2.5	--	6.0	10.0
Heavy Duty (Drive Areas)	PCC	--	--	6.0	4.0	10.0
	AC	1.5	3.5	--	6.0	11.0
Trash Container Pad [3]	PCC	--	--	8.0	4.0	12.0

1. 4,000 psi at 28 days. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.
2. Crushed limestone base material
3. The trash container pad should be large enough to support the container and the tipping axle of the collection truck.

The design approach used to determine the asphalt pavement thicknesses presented in the table was based on the National Asphalt Pavement Association (NAPA), which is specific to low-volume pavements. Portland Cement Concrete (PCC) pavement thicknesses were based on the American Concrete Institute (ACI) design recommendations. The above sections represent minimum thicknesses and, as such, periodic maintenance should be anticipated.

For concrete pavement, proper joint spacing will also be required to reduce the potentials of excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer. Refer to ACI 330 “Guide for Design and Construction of Concrete Parking Lots” for additional information.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Based on the possibility of shallow and/or perched groundwater, we recommend installing a pavement subdrain system to control groundwater, improve stability, and improve long-term pavement performance.

Due to frost-susceptible soils and the possibility of perched groundwater, consideration should be given to installing a pavement subdrain system to control subgrade moisture, improve stability, and improve long-term pavement performance.

We recommend at least 6 inches of free-draining granular material be placed beneath the pavements. The use of a free draining granular base will also reduce the potential for frost action. We recommend pavement subgrades be crowned at least 2% to promote the flow of water towards the subdrains, and to reduce the potential for ponding of water on the subgrade. The design recommendations for the subdrains are provided in the following table:

Subdrain Design Recommendations	
Item	**Value**
Free Draining Granular Base Thickness below Pavement	6 inches of material meeting No. 57 aggregate specifications
Minimum Drain Pipe Diameter	4 inches
Drain Trench Width	16 inches or greater to provide minimum 6-inch annulus of drainage aggregate around drain pipe.
Invert Depth below Subgrade Elevation	3½ feet
Maximum Drain Pipe Spacing	50 feet
Subdrain Trench Backfill Material	No. 57 aggregate or ¾-inch aggregate

The subdrains should be hydraulically connected to the free-draining granular base layer. Subdrains should be sloped to provide positive gravity drainage to reliable discharge points. Periodic maintenance of subdrains is required for long-term proper performance.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required. Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.

- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is D**. Subsurface explorations at this site were extended to a maximum depth of 65.1 feet. Subsurface conditions at the boring termination depth were assumed to continue to depths of 100 feet for the purpose of the seismic analysis. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

GENERAL COMMENTS

As the project progresses, we address assumptions by incorporating information provided by the design team, if any. Revised project information that reflects actual conditions important to our services is reflected in the final report. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. This facilitates the incorporation of our opinions related to implementation of our geotechnical recommendations. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are

noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Our field exploration work included the drilling and sampling of exploratory soil borings consistent with the following schedule.

Number of Borings	Boring Depth (feet)	Planned Location
B-1	65	Building
B-2	65.1	Building
B-3	58	Building
B-4	11.5	Parking Areas
B-5	11.5	Parking Areas
B-6	11.5	Parking Areas

Boring Layout and Elevations: Specific locations of the soil borings are shown on our **Exploration Plan**. The locations were established in the field by Terracon personnel referencing existing site features. Coordinates were obtained from desktop software and elevations were estimated from Google Earth. The elevations shown on the boring logs are rounded to the nearest one foot. If elevations and a more precise boring layout are desired, we recommend the boring locations be surveyed.

Subsurface Exploration Procedures: The test borings were drilled with a track-mounted rotary drill rig. Hollow stem augers were used to advance the boreholes. Soil samples were collected using the split-barrel sampling procedure. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound Acker Rebel auto-hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in-situ relative density of granular soils and consistency of cohesive soils.

An automatic Standard Penetration Test (SPT) hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method.

The spilt-barrel samples were sealed in watertight glass jars upon sample extraction. All samples were returned to the laboratory for testing and classification.

Information provided on the boring logs attached to this report includes soil descriptions, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with auger cuttings prior to the drill crew leaving the site.

Our exploration team prepared field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Groundwater observations were also recorded. Final boring logs were prepared from the field logs. The final boring logs represent the engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in the laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned various laboratory tests to better understand the engineering properties of the various soil strata as necessary for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods are applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D6913/D6913M(2017) Standard Test Method for Particle-Size Distribution (Gradation) of Soils using Sieve Analysis
- ASTM D7928(2017) Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
- ASTM D7012-14e1 Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

The laboratory testing program included examination of soil samples by an engineer. Based on the material’s texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION PLAN

East End Building ■ Charleston, West Virginia
July 2, 2020 ■ Terracon Project No. N2195065

Terracon GeoReport

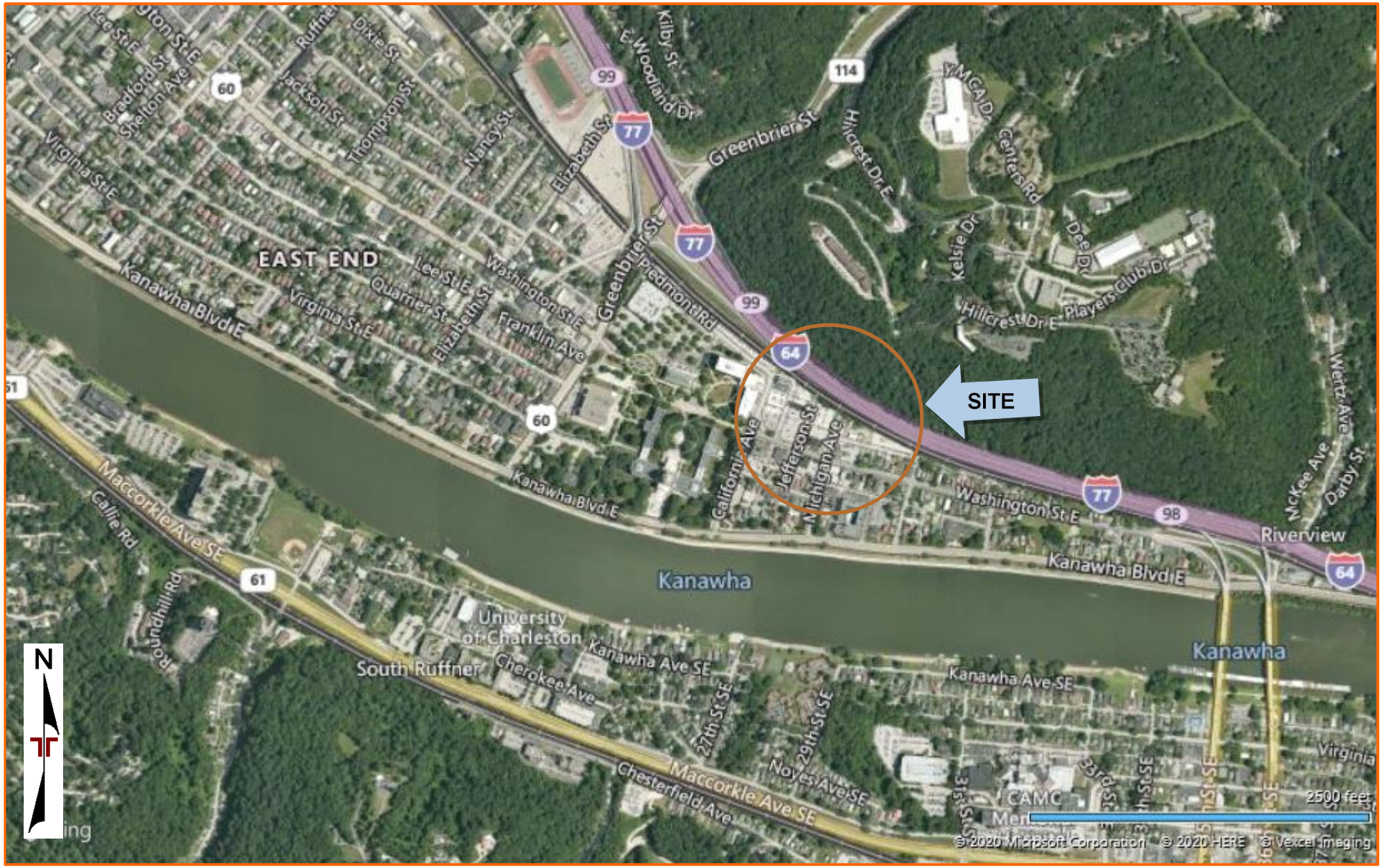


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

East End Building ■ Charleston, West Virginia

July 2, 2020 ■ Terracon Project No. N2195065

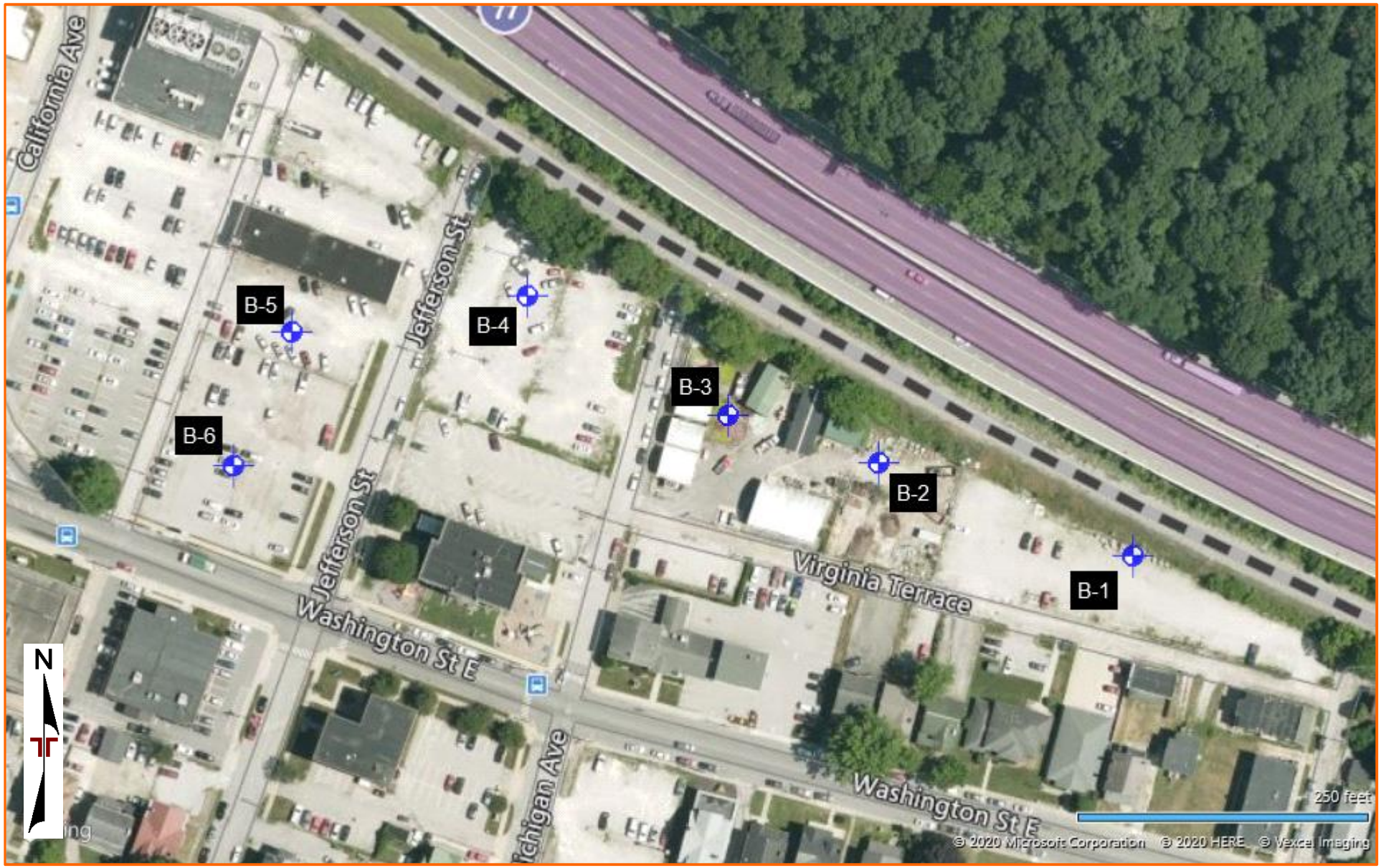


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

As-Drilled Boring Location

EXPLORATION PLAN

East End Building ■ Charleston, West Virginia
July 23, 2020 ■ Terracon Project No. N2195065

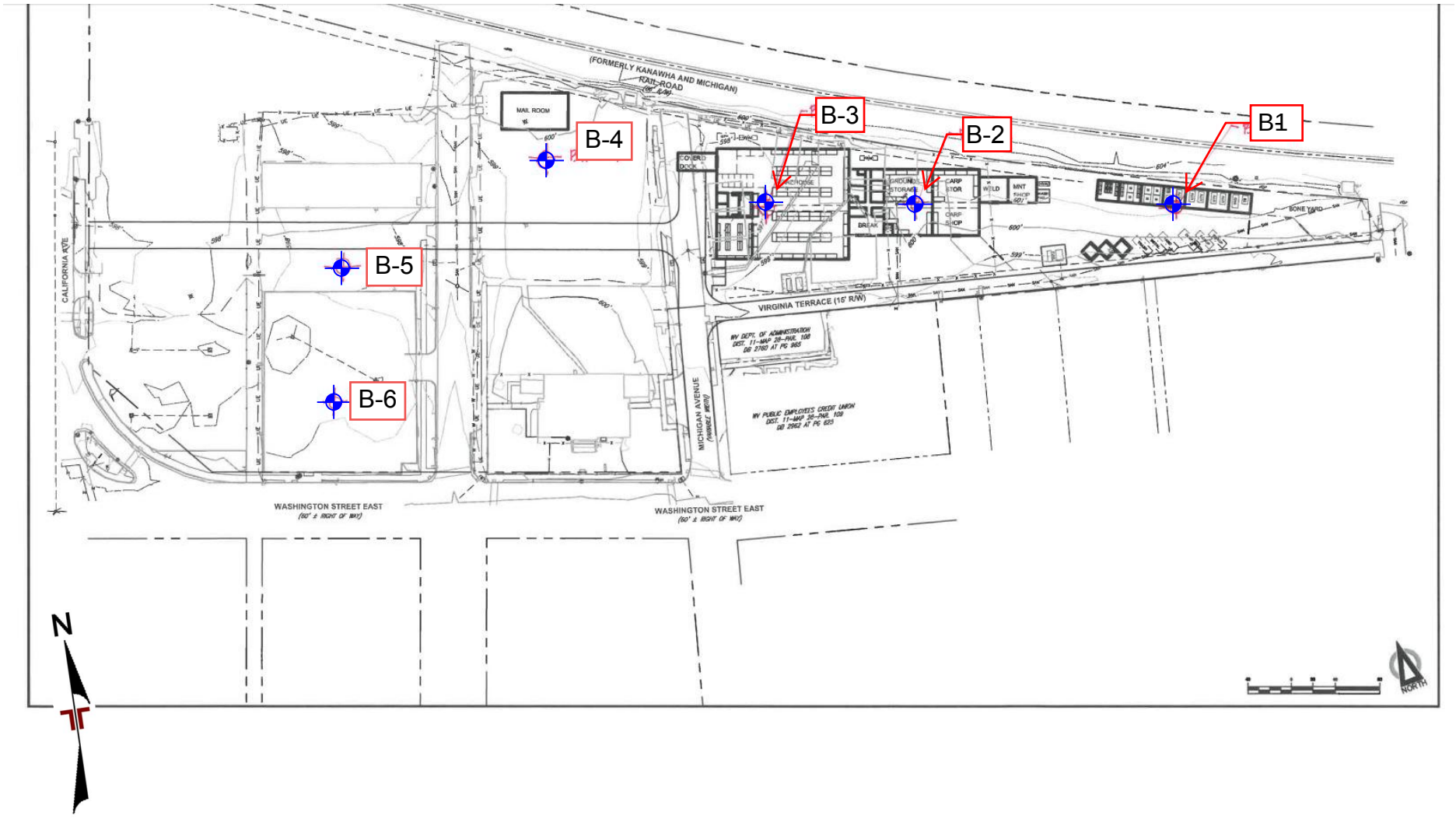


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

As-Drilled Boring Location

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.337° Longitude: -81.6065°

Approximate Surface Elev.: 602 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.2	602+/-	**AGGREGATE BASE COURSE**
		FILL - POORLY GRADED SAND WITH GRAVEL, trace clay, fine to coarse grained, gray and brown, gravel consists of limestone crusher run
5.0	597+/-	**FILL - LEAN CLAY WITH SAND**, trace gravel, brown and gray
10.0	592+/-	**LEAN CLAY WITH SAND (CL)**, brown and gray, stiff
17.5	584.5+/-	**LEAN CLAY (CL)**, trace sand, gray with brown, very soft to soft
25.0	577+/-	

DEPTH (Ft.)	RECOVERY (in.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
	10	6-13-15 N=28			
	6	25-8-3 N=11			
5	18	1-3-2 N=5		25.0	
	12	1-3-4 N=7			
10	18	2-4-6 N=10	2.25 (HP)	27.4	33-20-13
	18	2-3-5 N=8			
15	18	1-3-6 N=9			
	18	1-1-2 N=3		28.1	29-17-12
20	18	0-0-1 N=1			
25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Elevation Reference: Google Earth

WATER LEVEL OBSERVATIONS

Groundwater encountered at 2.5 feet while drilling.

40 ft - Water introduced for rock coring.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-01-2020 | Boring Completed: 06-02-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-1

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.337° Longitude: -81.6065°

Approximate Surface Elev.: 602 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (in.)	FIELD TEST RESULTS	RQD (%)	WATER CONTENT (%)	UNCONFINED COMPRESSIVE STRENGTH (tsf)
		SANDY SILTY CLAY (CL-ML), gray, medium stiff	18	0-2-3 N=5		27.2	
30.0	572+/-						
		CLAYEY SAND (SC), fine to medium grained, orange brown and gray, dense	12	6-8-26 N=34			
35.0	567+/-						
		SANDY LEAN CLAY (CL), trace sandstone rock fragments, gray and brown, hard	18	4-11-21 N=32			
40.0	562+/-						
		SANDSTONE, brown, fine to medium-grained, close to moderate fracture spacing, thick bedding, slightly to moderately weathered, weak rock	0	50/0"			131.25
		43 to 45: highly weathered (fractured) 43.1 to 43.3 ft: clay seam	41		43		
			4		0		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater encountered at 2.5 feet while drilling.

40 ft - Water introduced for rock coring.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-01-2020 | Boring Completed: 06-02-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-1

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.337° Longitude: -81.6065°

Approximate Surface Elev.: 602 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	RECOVERY (in.)	RQD (%)	UNCONFINED COMPRESSIVE STRENGTH (tsf)
		SANDSTONE, brown, fine to medium-grained, close to moderate fracture spacing, thick bedding, slightly to moderately weathered, weak rock *(continued)*		0	0	
55.0	547+/-		55			
		SHALE, gray, close to moderate fracture spacing, thick bedding, slightly to moderately weathered, weak rock, interbedded with sandstone		60	88	70.83
60.7	541.5+/-		60			
		SANDSTONE, gray, fine-grained, close fracture spacing, thick bedding, moderately weathered, weak rock, with shale streaks 63.7 to 65 ft: interbedded with shale		60	52	
65.0	537+/-		65			
		Boring Terminated at 65 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater encountered at 2.5 feet while drilling.

40 ft - Water introduced for rock coring.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-01-2020 | Boring Completed: 06-02-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-2

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3372° Longitude: -81.6072°

Approximate Surface Elev.: 600 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.4	599.5+/-	**AGGREGATE BASE COURSE**
		FILL - LEAN CLAY (CL), trace sand, brown and gray
5.0	595+/-	**LEAN CLAY WITH SAND (CL)**, trace gravel, brown, medium stiff
20.0	580+/-	**SANDY LEAN CLAY WITH GRAVEL (CL)**, brown, medium stiff to stiff
25.0	575+/-	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
	▽	X	18	1-2-1 N=3				27.5	34-19-15
5		X	18	1-2-3 N=5		1.5 (HP)		24.7	
		X	18	2-3-2 N=5		2.75 (HP)			
10		X	18	3-3-5 N=8		2.0 (HP)		25.3	36-22-14
		X	18	2-3-3 N=6		3.0 (HP)			
15		X	18	2-2-4 N=6					
		X	18	2-3-3 N=6				24.6	
20		X	18	2-4-4 N=8		0.75 (HP)		27.9	30-18-12
25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Elevation Reference: Google Earth

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered at 3 ft while drilling.*

55.1 ft - Water introduced for rock coring.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-04-2020 | Boring Completed: 06-04-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-2

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3372° Longitude: -81.6072°

Approximate Surface Elev.: 600 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	RECOVERY (in.)	FIELD TEST RESULTS
CLAYEY SAND (SC), fine grained, gray and brown, loose to medium dense			18	3-5-4 N=9
			18	4-5-6 N=11
35.0	565+/-			
SILTY SAND WITH GRAVEL (SM), fine grained, brown, medium dense			14	13-17-12 N=29
			16	9-16-13 N=29
45.0	555+/-			
SANDY LEAN CLAY (CL), trace gravel, gray with brown, very stiff			18	11-13-10 N=23

GRAPHIC LOG | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RQD (%) | LABORATORY HP (tsf) | UNCONFINED COMPRESSIVE STRENGTH (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS (LL-PL-PI)

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater encountered at 3 ft while drilling.

55.1 ft - Water introduced for rock coring.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-04-2020 | Boring Completed: 06-04-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-2

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3372° Longitude: -81.6072°

Approximate Surface Elev.: 600 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	RECOVERY (in.)	FIELD TEST RESULTS	RQD (%)	UNCONFINED COMPRESSIVE STRENGTH (tsf)
		SANDY LEAN CLAY (CL), trace gravel, gray with brown, very stiff *(continued)*		18	7-7-10 N=18		
55.0	545+/-		55				
55.1	545+/-	**SHALE**, gray, completely weathered, very weak		1	50/1"		
56.1	544+/-	**CLAYSTONE**, gray brown, close fracture spacing, medium bedding, moderately weathered, weak rock, gray clay seam noted from 55.1 to 55.3 ft					182.48
57.9	542+/-	**SILTY SHALE**, gray brown, close to moderate fracture spacing, medium bedding, moderately weathered, weak rock		60		77	
		SANDSTONE, gray, fine-grained, close to moderate fracture spcaing, thick bedding, slightly to moderately weathered, weak to medium strong	60				
		60.3 to 61 ft: highly weathered (fractured)					
				55		40	
		63 to 65 ft: wide fracture spacing, medium strong					
65.1	535+/-		65				
		Boring Terminated at 65.1 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater encountered at 3 ft while drilling.

55.1 ft - Water introduced for rock coring.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-04-2020 | Boring Completed: 06-04-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-3

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3374° Longitude: -81.6077°

Approximate Surface Elev.: 597 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.2	597+/-	**ASPHALT**
		FILL - LEAN CLAY WITH SAND, trace gravel, gray and brown
7.5	589.5+/-	**FILL - LEAN CLAY**, trace sand, brown and gray
15.0	582+/-	**LEAN CLAY WITH SAND (CL)**, trace silt, brown, soft to medium stiff
		17.5 to 21.5 ft: brown and gray

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		18	2-2-2 N=4		
5		18	2-3-3 N=6	26.1	
		18	2-3-2 N=5		
10		18	3-4-5 N=9	24.3	
		18	2-3-3 N=6		
15		18	2-3-4 N=7	25.3	31-19-12
		18	2-2-2 N=4		
20		18	0-0-2 N=2	25.6	
25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Elevation Reference: Google Earth

WATER LEVEL OBSERVATIONS

Groundwater encountered at 26 ft while drilling.

48 ft - Water introduced for rock coring.

Water observed at ground surface at boring completion.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-10-2020 | Boring Completed: 06-10-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-3

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3374° Longitude: -81.6077°

Approximate Surface Elev.: 597 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)
		LEAN CLAY WITH SAND (CL), trace silt, brown, soft to medium stiff *(continued)*	18	2-2-3 N=5	
			18	0-3-19 N=22	
31.0	566+/-	**SILTY SAND WITH GRAVEL (SM)**, fine to medium grained, gray, medium dense	16	4-5-7 N=12	
			14	4-6-8 N=14	18.5
45.5	551.5+/-	**SILTY SAND (SM)**, trace gravel, fine grained, brown, very dense, residual soil from sandstone	10	17-50/6"	
48.0	549+/-	**SHALE**, gray, close fracture spacing, thin bedding, slightly weathered, weak rock	0	50/0"	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater encountered at 26 ft while drilling.

48 ft - Water introduced for rock coring.

Water observed at ground surface at boring completion.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-10-2020 | Boring Completed: 06-10-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-3

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3374° Longitude: -81.6077°

Approximate Surface Elev.: 597 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
						60		57				
53.5	543.5+/-											
			55			60		67		322.17		
58.0	539+/-											

SHALE, gray, close fracture spacing, thin bedding, slightly weathered, weak rock *(continued)*

51.8 to 53.2 ft: interbedded with sandstone

53.2 to 53.5 ft: highly weathered (fractured) sandstone

SANDSTONE, gray, fine-grained, close to moderate fracture spacing, thick bedding, weak to medium strong, with shale streaks

Boring Terminated at 58 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater encountered at 26 ft while drilling.

48 ft - Water introduced for rock coring.

Water observed at ground surface at boring completion.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-10-2020 | Boring Completed: 06-10-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-4

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3376° Longitude: -81.6083°

Approximate Surface Elev.: 599 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		FILL - SILTY GRAVEL WITH SAND, light brown and gray, gravel consists of limestone crusher run				12	13-14-13 N=27					
		2.5 to 4 ft: trace brown clay				8	14-3-3 N=6					
5.0	594+/-		5									
		FILL - LEAN CLAY WITH SAND, trace gravel, brown and gray				18	0-2-3 N=5				26.9	36-18-18
						16	2-3-5 N=8					
10.0	589+/-		10									
		LEAN CLAY (CL), trace sand, brown, medium stiff				18	3-3-4 N=7				26.0	38-23-15
11.5	587.5+/-											
		Boring Terminated at 11.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Elevation Reference: Google Earth

WATER LEVEL OBSERVATIONS

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-03-2020 | Boring Completed: 06-03-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-5

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3376° Longitude: -81.609°

Approximate Surface Elev.: 599 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.5	598.5+/-	**AGGREGATE BASE COURSE**
		FILL - SILTY SAND WITH GRAVEL, fine grained, gray brown, gravel consists of limestone crusher run
2.5	596.5+/-	
		FILL - LEAN CLAY, trace silt, trace sand, brown and gray
7.5	591.5+/-	
		SILTY CLAY (CL-ML), trace sand, trace gravel, brown, medium stiff to stiff
11.5	587.5+/-	
		Boring Terminated at 11.5 Feet

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)
		12	6-19-50/1"	
		18	3-4-4 N=8	25.3
5		18	2-2-5 N=7	
		18	3-4-5 N=9	
10		18	2-4-7 N=11	23.2

WATER LEVEL OBSERVATIONS

RQD (%)

LABORATORY HP (tsf)

UNCONFINED COMPRESSIVE STRENGTH (tsf)

ATTERBERG LIMITS

LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Elevation Reference: Google Earth

WATER LEVEL OBSERVATIONS

Groundwater encountered at 2 ft while drilling.

Water observed at 5 ft at boring completion.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-03-2020 | Boring Completed: 06-03-2020

Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

BORING LOG NO. B-6

PROJECT: East End Building

CLIENT: Chapman Technical Group
Saint Albans, WV

SITE: Washington St E
Charleston, WV

LOCATION See Exploration Plan

Latitude: 38.3372° Longitude: -81.6092°

Approximate Surface Elev.: 600 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0.3	599.5+/-										
AGGREGATE BASE COURSE											
FILL - LEAN CLAY, trace sand, trace gravel, brown				X	18	2-3-3 N=6				25.1	
		5		X	18	2-2-4 N=6					
			▽	X	18	1-2-4 N=6				23.9	
10.0	590+/-	10									
LEAN CLAY (CL), trace sand, brown, stiff				X	18	3-4-5 N=9				25.8	37-23-14
11.5	588.5+/-										
Boring Terminated at 11.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger/NQ2 Barrel

Abandonment Method:
Boring backfilled with bentonite
Surface capped with gravel

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Elevation Reference: Google Earth

WATER LEVEL OBSERVATIONS

▽ *Groundwater encountered at 9 ft while drilling.*

Water observed at 9.5 ft at boring completion.

Terracon
912 Morris St
Charleston, WV

Boring Started: 06-03-2020 | Boring Completed: 06-03-2020

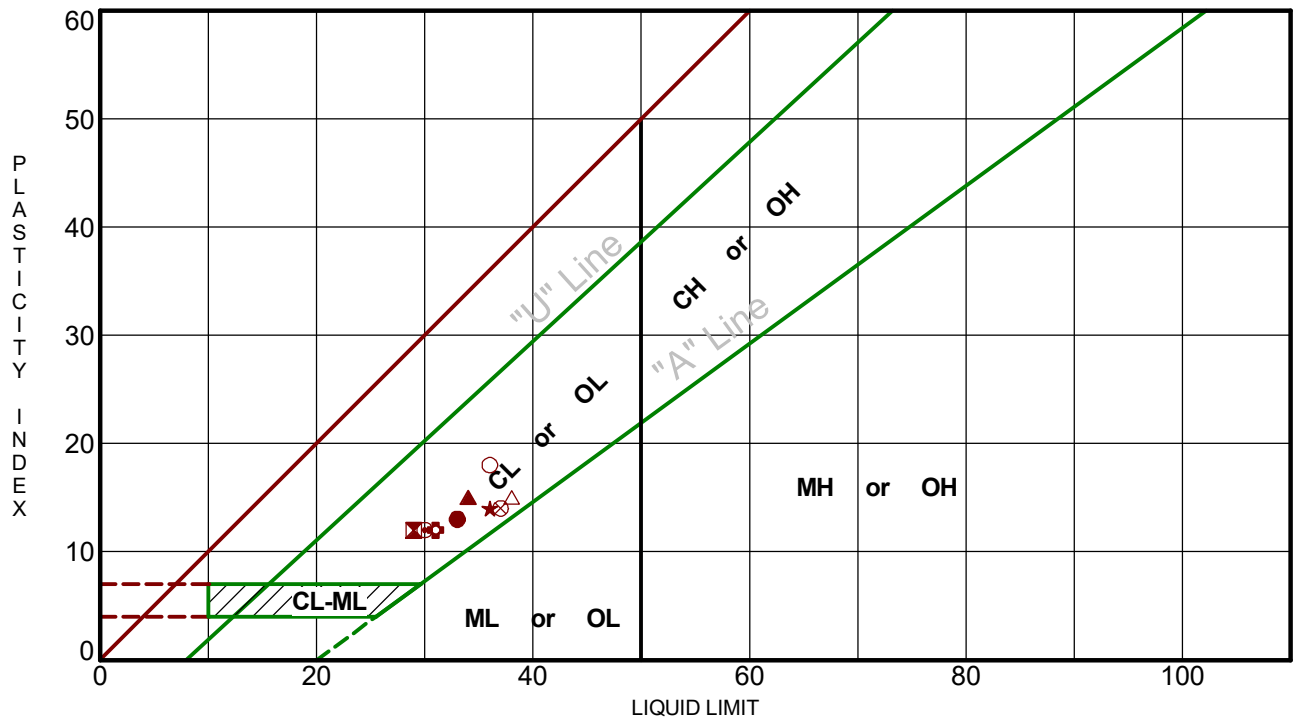
Drill Rig: DR621 | Driller: B. Cogar

Project No.: N2195065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/15/20

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	B-1	10 - 11.5	33	20	13	83.5	CL	LEAN CLAY with SAND
⊠	B-1	17.5 - 19	29	17	12	86.1	CL	LEAN CLAY
▲	B-2	2.5 - 4	34	19	15		CL	LEAN CLAY
★	B-2	10 - 11.5	36	22	14	83.8	CL	LEAN CLAY with SAND
⊙	B-2	20 - 21.5	30	18	12	55.8	CL	SANDY LEAN CLAY with GRAVEL
✿	B-3	15 - 16.5	31	19	12	77.1	CL	LEAN CLAY with SAND
○	B-4	5 - 6.5	36	18	18		CL	LEAN CLAY with SAND
△	B-4	10 - 11.5	38	23	15		CL	LEAN CLAY
⊗	B-6	10 - 11.5	37	23	14		CL	LEAN CLAY

PROJECT: East End Building

PROJECT NUMBER: N2195065

SITE: Washington St E
Charleston, WV

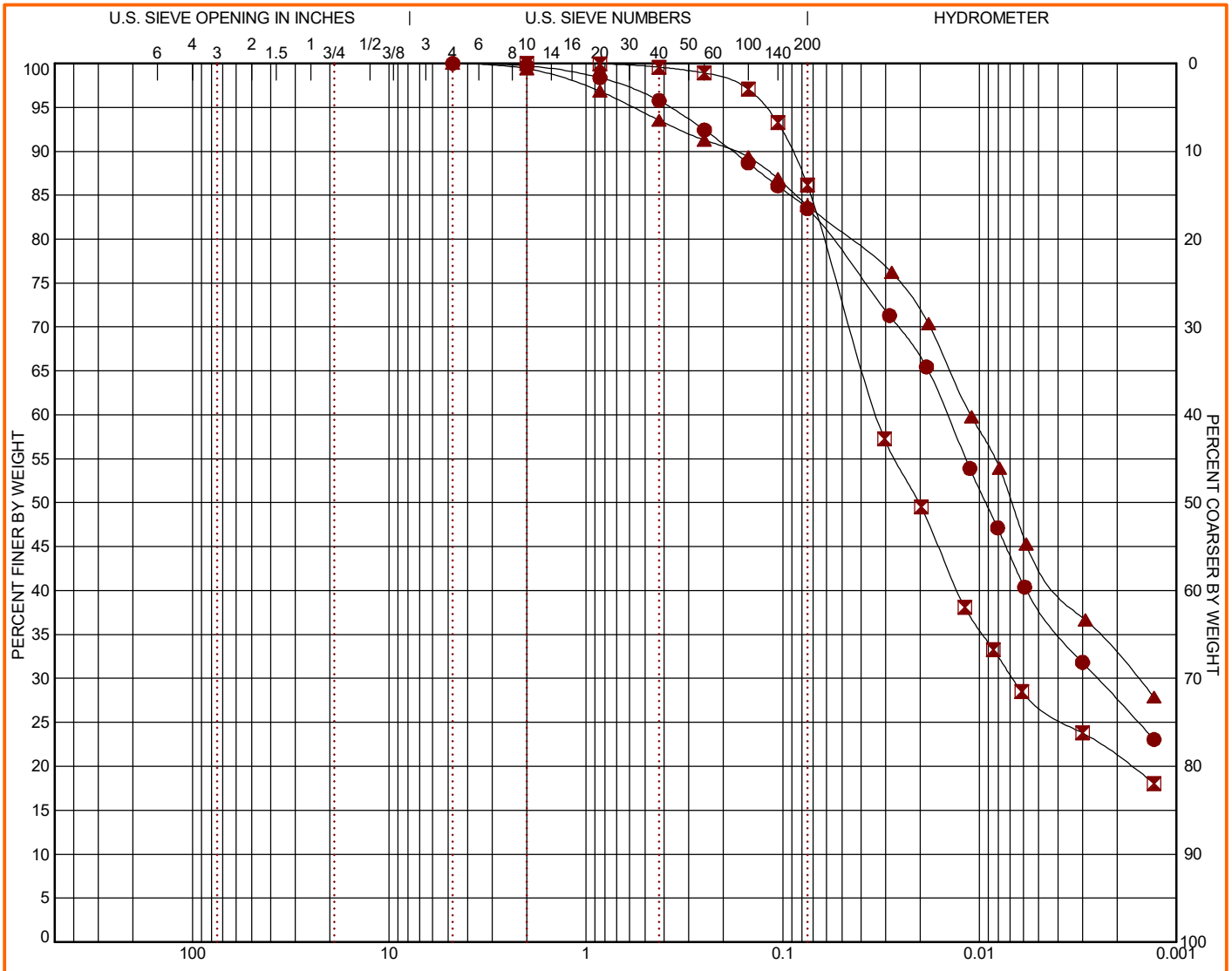
Terracon
912 Morris St
Charleston, WV

CLIENT: Chapman Technical Group
Saint Albans, WV

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/7/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-1	10 - 11.5	0.0	0.0	16.5	45.2		38.3	CL
⊠	B-1	17.5 - 19	0.0	0.0	13.9	59.0		27.2	CL
▲	B-2	10 - 11.5	0.0	0.0	16.2	40.4		43.4	CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.015	0.033	0.011
D_{30}	0.003	0.007	0.002
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	#10	100.0	#4	100.0
#10	99.72	#20	99.95	#10	99.4
#20	98.38	#40	99.58	#20	96.84
#40	95.77	#60	98.91	#40	93.52
#60	92.41	#100	97.1	#60	91.28
#100	88.68	#140	93.25	#100	89.37
#140	86.06	#200	86.14	#140	86.91
#200	83.47			#200	83.83

SOIL DESCRIPTION	
●	LEAN CLAY with SAND (CL)
⊠	LEAN CLAY (CL)
▲	LEAN CLAY with SAND (CL)

REMARKS	
●	
⊠	
▲	

PROJECT: East End Building

PROJECT NUMBER: N2195065

SITE: Washington St E
Charleston, WV

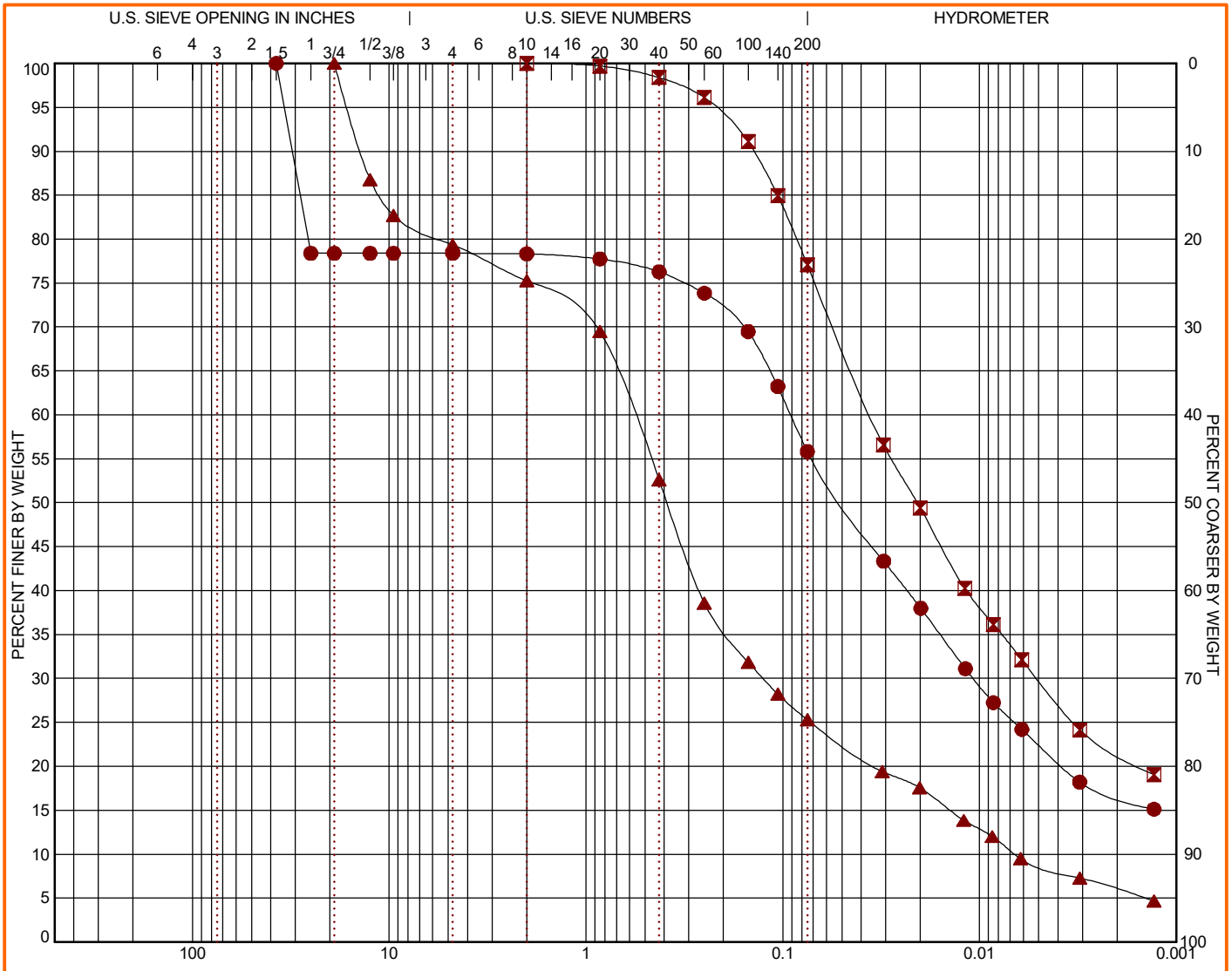
Terracon
912 Morris St
Charleston, WV

CLIENT: Chapman Technical Group
Saint Albans, WV

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/7/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-2	20 - 21.5	0.0	21.6	22.6	33.4		22.4	CL
⊠	B-3	15 - 16.5	0.0	0.0	22.9	47.3		29.8	CL
▲	B-3	40 - 41.5	0.0	20.6	54.1	16.5		8.8	

GRAIN SIZE	●	⊠	▲
D_{60}	0.091	0.036	0.576
D_{30}	0.011	0.005	0.126
D_{10}			0.007

COEFFICIENTS	●	⊠	▲
C_C			4.13
C_U			86.73

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1 1/2"	100.0	#10	100.0	3/4"	100.0
1"	78.39	#20	99.71	1/2"	86.78
3/4"	78.39	#40	98.4	3/8"	82.71
1/2"	78.39	#60	96.12	#4	79.36
3/8"	78.39	#100	91.1	#10	75.27
#4	78.39	#140	84.97	#20	69.49
#10	78.32	#200	77.07	#40	52.62
#20	77.74			#60	38.57
#40	76.28			#100	31.87
#60	73.84			#140	28.22
#100	69.48			#200	25.29
#140	63.22				
#200	55.82				

SOIL DESCRIPTION	
●	SANDY LEAN CLAY with GRAVEL (CL)
⊠	LEAN CLAY with SAND (CL)
▲	SILTY SAND with GRAVEL (SM)

REMARKS	
●	
⊠	
▲	

PROJECT: East End Building

PROJECT NUMBER: N2195065

SITE: Washington St E
Charleston, WV

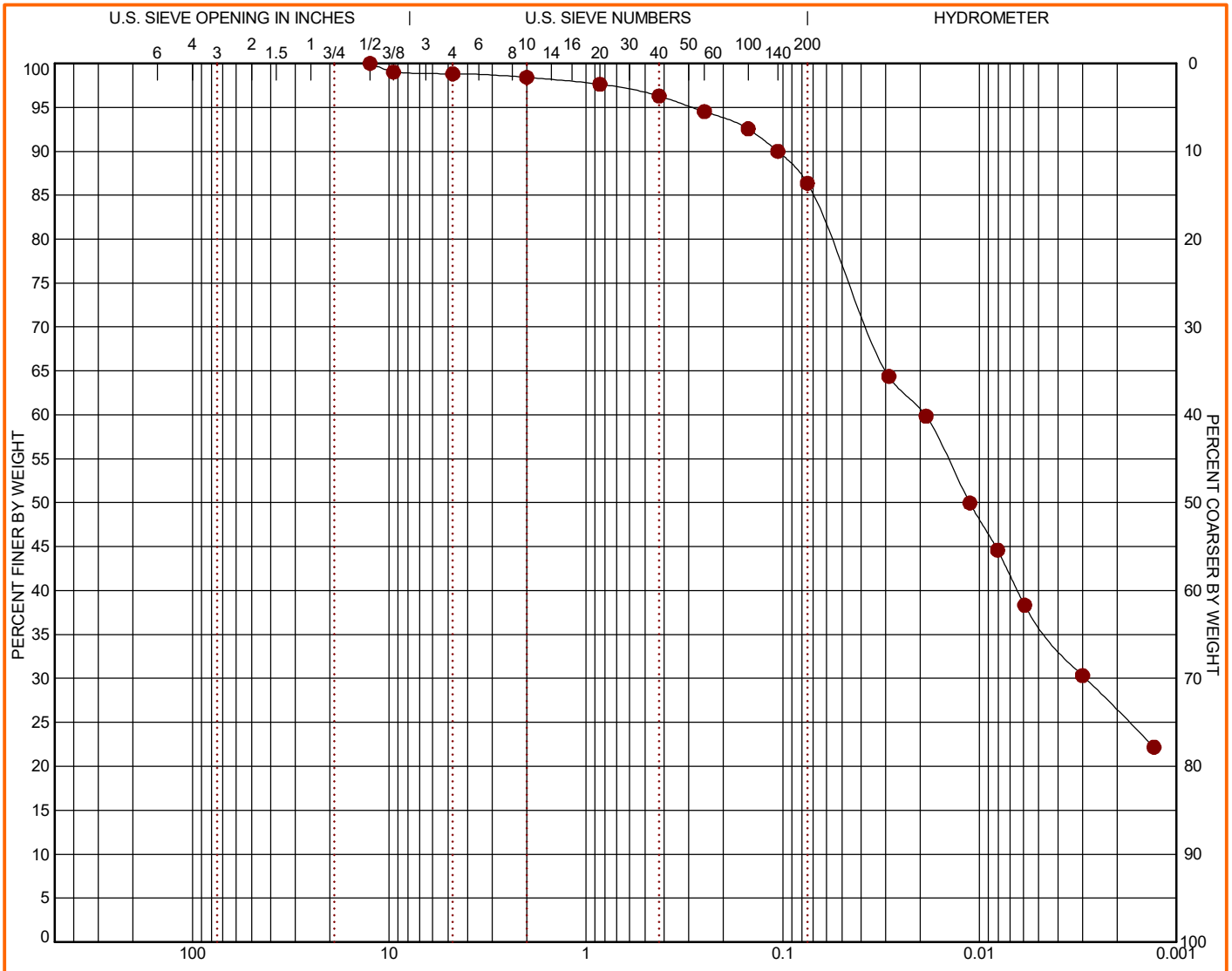
Terracon
912 Morris St
Charleston, WV

CLIENT: Chapman Technical Group
Saint Albans, WV

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/7/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-5	10 - 11.5	0.0	1.2	12.4	50.0		36.4	

GRAIN SIZE			
	●		
D_{60}	0.019		
D_{30}	0.003		
D_{10}			

COEFFICIENTS			
	●		
C_C			
C_U			

● Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1/2"	100.0				
3/8"	99.01				
#4	98.81				
#10	98.42				
#20	97.63				
#40	96.29				
#60	94.51				
#100	92.55				
#140	89.99				
#200	86.36				

SOIL DESCRIPTION	
●	SILTY CLAY (CL-ML)

REMARKS	
●	

PROJECT: East End Building

SITE: Washington St E
Charleston, WV

Terracon
912 Morris St
Charleston, WV

PROJECT NUMBER: N2195065

CLIENT: Chapman Technical Group
Saint Albans, WV

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 N2195065 EAST END BUILDING.GPJ TERRACON_DATATEMPLATE.GDT 7/7/20

912 Morris Street
Charleston, WV 25301
(304) 344-0821

Unconfined Compression Test of Intact Rock Core Report
ASTM D 7012 Method C

Client: The Chapman Technical Group Saint Albans, WV
Project: East End Building
Project No: N2195065

Boring No: B-1
Depth (ft): 41.0-41.5

Test Date: 6/30/2020

Avg. Specimen Diameter (in.): 1.970
Area (in.²): 3.05
Avg. Specimen Length (in.): 3.950
L/D Ratio: 2.0
Natural Density, lb/ft³ 140

Total Load (lbf.): 5560
Rate of Loading (lbs/sec): 130
Rate of Deformation (in/min): 0.008
Break Time (minutes): 3.00

Compressive Strength (psi): 1823
Compressive Strength (psf): 262505
Compressive Strength (tsf): 131

Moisture Content (%): 0.02

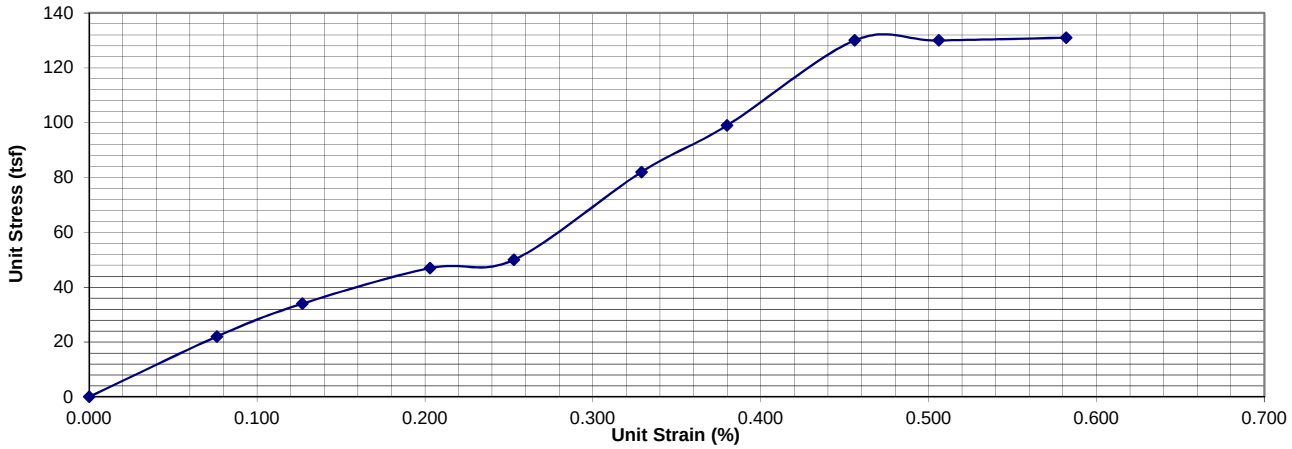
Deformation (in.)	Load (lbs.)	Strain (%)	Stress (psi)	Strength (tsf)
0.000	0	0.000	0	0
0.003	930	0.076	305	22
0.005	1450	0.127	475	34
0.008	2010	0.203	659	47
0.010	2130	0.253	698	50
0.013	3480	0.329	1141	82
0.015	4180	0.380	1370	99
0.018	5500	0.456	1803	130
0.020	5510	0.506	1807	130
0.023	5560	0.582	1823	131

Failure Photograph:



Test sample prepared in general accordance to ASTM D4543

Straightness: Procedure S1 Parallelism: Procedure FP2
Flatness: Procedure FP2 Perpendicularity: Procedure P2



The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicableto the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

912 Morris Street
Charleston, WV 25301
(304) 344-0821

Unconfined Compression Test of Intact Rock Core Report
ASTM D 7012 Method C

Client: The Chapman Technical Group Saint Albans, WV
Project: East End Building
Project No: N2195065

Boring No: B-1
Depth (ft): 57.2-57.6

Test Date: 6/30/2020

Avg. Specimen Diameter (in.): 1.980
Area (in.²): 3.08
Avg. Specimen Length (in.): 4.010
L/D Ratio: 2.0
Natural Density, lb/ft³ 174.3

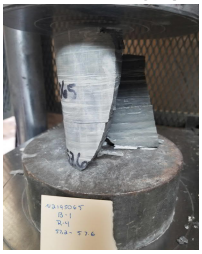
Total Load (lbf.): 3030
Rate of Loading (lbs/sec): 130
Rate of Deformation (in/min): 0.012
Break Time (minutes): 3.00

Compressive Strength (psi): 984
Compressive Strength (psf): 141662
Compressive Strength (tsf): 71

Moisture Content (%): 0.01

Deformation (in.)	Load (lbs.)	Strain (%)	Stress (psi)	Strength (tsf)
0.000	0	0.000	0	0
0.003	260	0.075	84	6
0.005	390	0.125	127	9
0.008	540	0.200	175	13
0.010	660	0.249	214	15
0.013	830	0.324	269	19
0.015	1040	0.374	338	24
0.018	1270	0.449	412	30
0.020	1530	0.499	497	36
0.023	1790	0.574	581	42
0.025	2090	0.623	679	49
0.028	2380	0.698	773	56
0.030	2720	0.748	883	64
0.035	3030	0.873	984	71

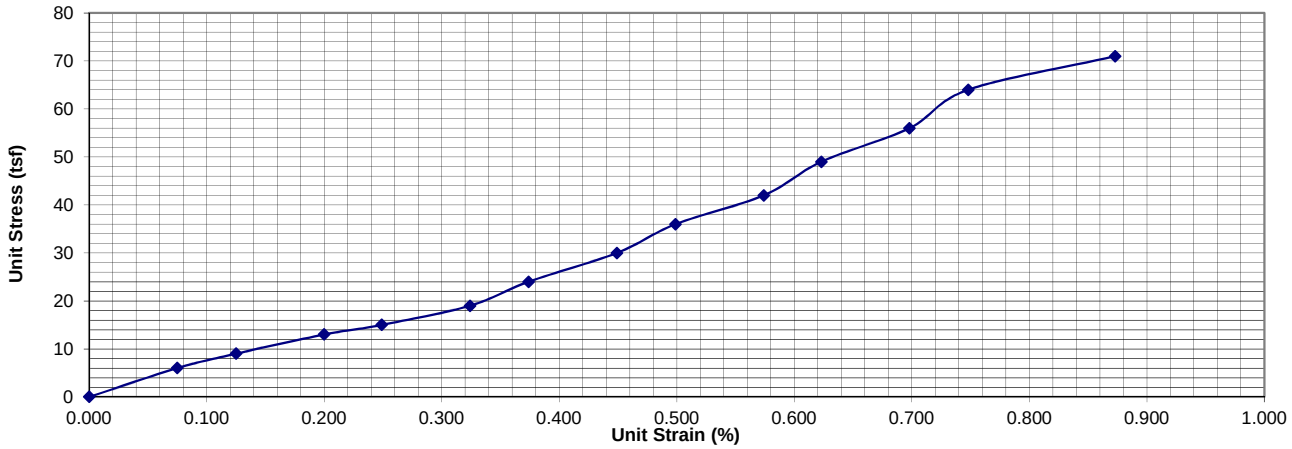
Failure Photograph:



Test sample prepared in general accordance to ASTM D4543

Straightness: Procedure S1 Parallelism: Procedure FP2

Flatness: Procedure FP2 Perpendicularity: Procedure P2



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912 Morris Street
Charleston, WV 25301
(304) 344-0821

Unconfined Compression Test of Intact Rock Core Report
ASTM D 7012 Method C

Client: The Chapman Technical Group Saint Albans, WV
Project: East End Building
Project No: N2195065

Boring No: B-2
Depth (ft): 56.6-57.0

Test Date: 6/30/2020

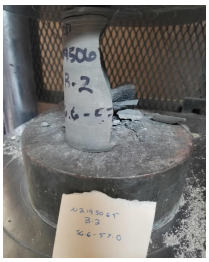
Avg. Specimen Diameter (in.): 1.970
Area (in.²): 3.05
Avg. Specimen Length (in.): 3.980
L/D Ratio: 2.0
Natural Density, lb/ft³ 168.6

Total Load (lbf.): 7730
Rate of Loading (lbs/sec): 130
Rate of Deformation (in/min): 0.030
Break Time (minutes): 3.00

Compressive Strength (psi): 2534
Compressive Strength (psf): 364957
Compressive Strength (tsf): 182

Moisture Content (%): 0.02

Failure Photograph:

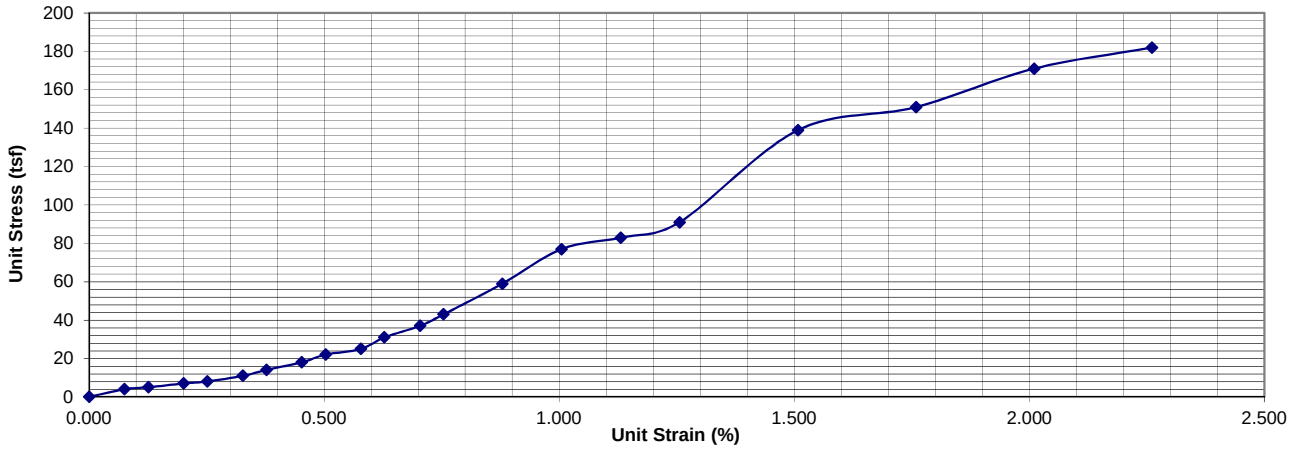


Deformation (in.)	Load (lbs.)	Strain (%)	Stress (psi)	Strength (tsf)
0.000	0	0.000	0	0
0.003	150	0.075	49	4
0.005	220	0.126	72	5
0.008	290	0.201	95	7
0.010	360	0.251	118	8
0.013	470	0.327	154	11
0.015	600	0.377	197	14
0.018	780	0.452	256	18
0.020	940	0.503	308	22
0.023	1080	0.578	354	25
0.025	1300	0.628	426	31
0.028	1550	0.704	508	37
0.030	1840	0.754	603	43
0.035	2500	0.879	820	59
0.040	3280	1.005	1075	77
0.045	3510	1.131	1151	83
0.050	3870	1.256	1269	91
0.060	5890	1.508	1931	139
0.070	6400	1.759	2098	151
0.080	7240	2.010	2374	171
0.090	7730	2.261	2534	182

Test sample prepared in general accordance to ASTM D4543

Straightness: Procedure S1 Parallelism: Procedure FP2

Flatness: Procedure FP2 Perpendicularity: Procedure P2



The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicableto the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

912 Morris Street
Charleston, WV 25301
(304) 344-0821

Unconfined Compression Test of Intact Rock Core Report
ASTM D 7012 Method C

Client: The Chapman Technical Group Saint Albans, WV
Project: East End Building
Project No: N2195065

Boring No: B-3
Depth (ft): 55.4-55.8

Test Date: 6/30/2020

Avg. Specimen Diameter (in.): 2.000
Area (in.²): 3.14
Avg. Specimen Length (in.): 4.000
L/D Ratio: 2.0
Natural Density, lb/ft³ 168.6

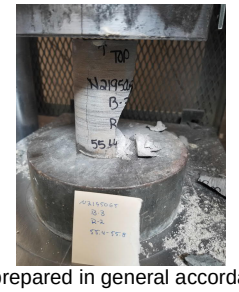
Total Load (lbf.): 14050
Rate of Loading (lbs/sec): 130
Rate of Deformation (in/min): 0.012
Break Time (minutes): 3.00

Compressive Strength (psi): 4475
Compressive Strength (psf): 644331
Compressive Strength (tsf): 322

Moisture Content (%): 0.00

Deformation (in.)	Load (lbs.)	Strain (%)	Stress (psi)	Strength (tsf)
0.000	0	0.000	0	0
0.003	1120	0.075	357	26
0.005	1780	0.125	567	41
0.008	2590	0.200	825	59
0.010	3300	0.250	1051	76
0.013	4260	0.325	1357	98
0.015	5260	0.375	1675	121
0.018	6430	0.450	2048	147
0.020	7900	0.500	2516	181
0.023	9370	0.575	2984	215
0.025	10730	0.625	3417	246
0.028	12370	0.700	3939	284
0.030	13620	0.750	4338	312
0.035	14050	0.875	4475	322

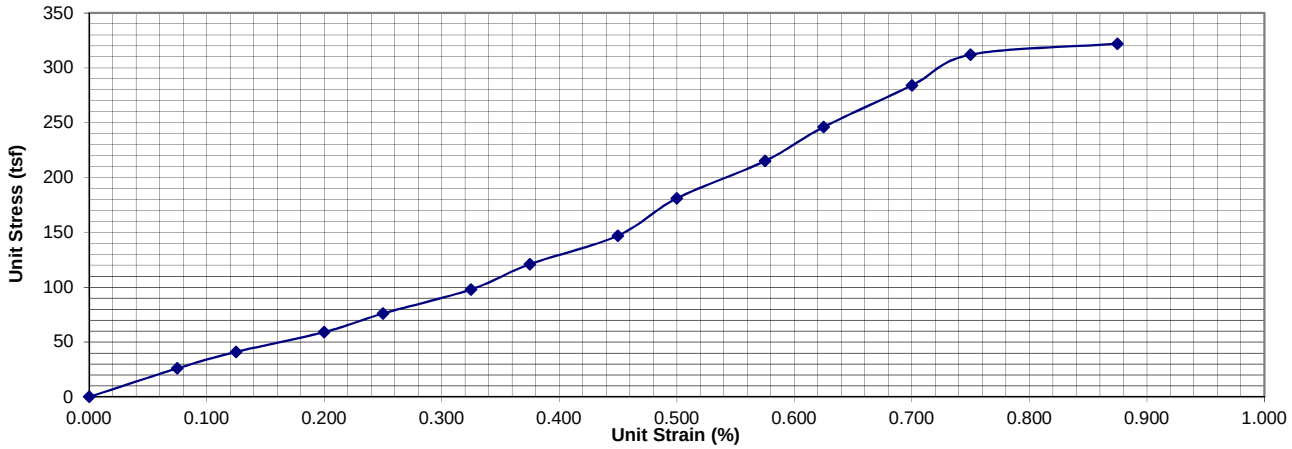
Failure Photograph:



Test sample prepared in general accordance to ASTM D4543

Straightness: Procedure S1 Parallelism: Procedure FP2

Flatness: Procedure FP2 Perpendicularity: Procedure P2



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SUPPORTING INFORMATION

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
East End Building ■ Charleston, WV
Terracon Project No. N2195065

Terracon GeoReport

SAMPLING	WATER LEVEL	FIELD TESTS
Rock Core Split Spoon	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			BEDROCK	
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1	< 20	Weathered
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4	20 - 29	Firm
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8	30 - 49	Medium Hard
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15	50 - 79	Hard
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30	>79	Very Hard
		Hard	> 4.00	> 30		

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

East End Building ■ Charleston, West Virginia

July 23, 2020 ■ Terracon Project No. N2195065

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ³ 4 and 1 £ Cc £ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or 1 > Cc > 3 [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ³ 6 and 1 £ Cc £ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or 1 > Cc > 3 [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above “A”		CL	Lean clay [K, L, M]
			PI < 4 or plots below “A” line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N] / Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above “A” line		CH	Fat clay [K, L, M]
			PI plots below “A” line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P] / Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ³ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains ³ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains ³ 30% plus No. 200 predominantly sand, add “sandy” to group name.

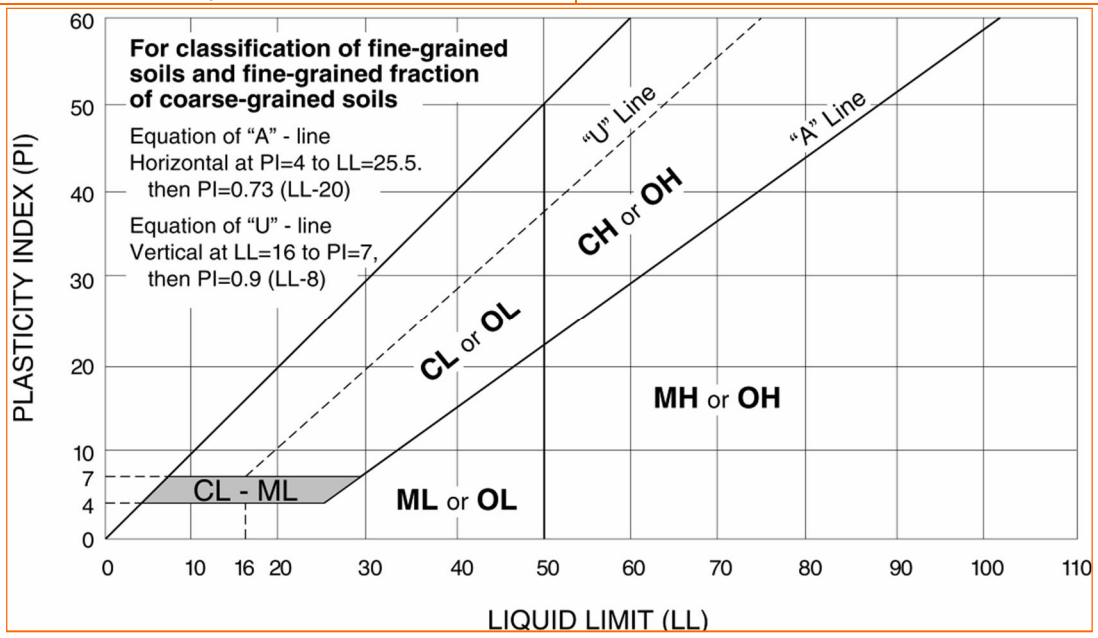
[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ³ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.



DESCRIPTION OF ROCK PROPERTIES

East End Building ■ Charleston, West Virginia

July 23, 2020 ■ Terracon Project No. N2195065

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

Phase I Environmental Site Assessment

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and 2100 Washington Street East

Charleston, Kanawha County, West Virginia

June 11, 2020

Terracon Project No. N2207015



Prepared for:
Chapman Technical Group
Saint Albans, West Virginia

Prepared by:
Terracon Consultants, Inc.
Charleston, West Virginia

June 11, 2020

Chapman Technical Group
200 6th Avenue, PO Box 1355
Saint Albans, West Virginia 25177-2837

Attn: Mr. Joseph E. Bird - Vice President
P: (304) 727-5501
E: jbirg@chaptech.com

Re: Phase I Environmental Site Assessment
Proposed State Capitol East Campus Redevelopment
311 Jefferson Street, 312 Michigan Avenue and 2100 Washington Street East
Charleston, Kanawha County, West Virginia (the site)
Terracon Project No. N2207015

Mr. Bird,

Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed Phase I Environmental Site Assessment (ESA) report. This assessment was performed in accordance with the agreement for services signed on May 22, 2020.

We appreciate the opportunity to be of service to you on this project. If there are any questions regarding this report or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,
Terracon Consultants, Inc.

Levi J. Sheff, AEP, CNRP
Sr. Staff Scientist

(for)
John B. Sallman
Sr. Principal

Attachments

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EXECUTIVE SUMMARY

This Phase I Environmental Site Assessment (ESA) was performed in accordance with the agreement for services signed on May 22, 2020 and was conducted consistent with the procedures included in American Society of Testing and Materials (ASTM) E1527-13, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. The ESA was conducted under the supervision or responsible charge of Levi J. Sheff, Environmental Professional, who performed the site reconnaissance on May 28, 2020.

Findings and Opinions

A summary of findings is provided below. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein.

Site Description and Use

The site is comprised of 24 mostly paved lots and a 1.1-acre portion of another lot (25 lots total) for a total area of approximately 5.2-acres in a State Capitol Campus setting of Charleston, Kanawha County, West Virginia. There are three addresses and operations currently associated with the site. The first operation is an approximately 4,506 square-foot (SF) three-story West Virginia Early Learning Academy (Daycare) located at 2100 Washington Street East (Parcel ID: 11 28009800000000, 0.67 acres, utilized building was constructed 1936); the second is a 5,760-SF Mailroom including minor carpentry activities, located at 311 Jefferson Street (Parcel ID: 11 28008800000000, 0.13 acres, constructed 1930) and the third is a fenced groundskeeping headquarters area serving the City of Charleston (improved with eight structures: an approximately 2,500-SF tent; a 1,325-SF office; 925- and 900-SF garages; three 650-SF tents and one 50-SF storage shed, constructed between 1995-2009) at 312 Michigan Avenue. Additional site improvements include several transformers, paved surfaces, storm drains, an inactive water well, and typical urban utilities.

Historical Information

Based on a review of available historical information, the site was developed with roads (currently Jefferson Street and Michigan Avenue) by the late-1890s. By the early-1930s, over 25 dwellings and a few apartment complexes existed throughout the site, some with associated garages and sheds. Additionally, an automotive repair shop (unknown identity) operated on the northwestern portion, the Capitol School operated on the south-central portion, and Virginian Electric, Inc. operated on the eastern portion. By the early-1950s, a wholesale hardware store took over the building of the historical automotive repair shop. By the early-1970s, an open deck garage operated on the northwestern corner and a different unidentified automotive repair shop and Materials Control, Soils and Testing (MCS&T) - West Virginia Division of Highways occupied the general area where Virginian Electric, Inc. was historically located. By the late-1980s, various unidentified offices occupied an area formerly developed with dwellings (near the wholesale hardware facility). Moreover, Capitol School operations seized around this time; however, the building remained in

place for the time being. Nearly site-wide overhaul/demolition/redevelopment occurred until approximately 2007-2009, which is when the current site configuration of paved parking lots, the Mailroom (western portion of the site), the Daycare (south-central portion) and eight structures (tents, garages, and the Groundskeeping Office - on the eastern portion) have since occupied and operated.

The MCS&T operated on the northeastern portion of the site from at least 1972-1989 (documented utilization of solvents and total petroleum hydrocarbons [TPHs]). Based on the timeframe of operations, this historical site operator represents a REC to the site.

The adjoining properties had a very similar development history as the site (adjoining roads and dwellings which then were reutilized/redeveloped in modern time for more commercial utilization by various operators ranging from retailers to, banks, administrators, government entities, etc.). Of these various utilizations and redevelopments, a Chandler's Texaco fuel station operated on the northeastern corner of Michigan Avenue and Washington Street East (southeast-adjacent to the site and cross-gradient) from at least 1933-1967. No related regulatory information for this fueling station was available to further evaluate if there were/are associated impacts to the subsurface from their underground storage tanks (USTs). Considering the lack of information, the potential for related petroleum impacts to have impacted the site constitutes a REC to the site.

Records Review

Selected federal and state environmental regulatory database information and responses from inquiries to local governmental agencies were reviewed for the site and adjoining properties. MCS&T was historically located on the eastern portion of the site (312 Michigan Avenue) and was reported in the resource conservation recovery act (RCRA) non-generator/no longer regulated (NonGen/NLR) and enforcement and compliance history (ECHO) databases in 1987, 1991 and 2003 for historically generating a small quantity of halogenated/non-halogenated solvents (no reported violations). The facility also historically utilized a 6,000-gallon gasoline UST (1996-1990) and a 1,000-gallon used oil tank (1966-1992) formerly located by the eastern and southeastern exterior of the current groundskeeping office. Tank/piping removals occurred in 1990 and 1992 while having reportedly excavated/disposed impacted soils. The site received closures (IDs: C-2511-92 and C-720-90) in 1990 and 1992 once the horizontal and vertical extents of the excavated tank basins were sampled (soils) and analyzed for associated TPHs (gasoline range and oil range organics). TPH concentrations were below the laboratory reporting limit for the used oil tank basin and TPH ranged from 37-91 milligrams per kilogram (mg/kg) in the gasoline tank basin, which is below the current 100 mg/kg guidance threshold. Moreover, groundwater sample concentrations of TPH and benzene, toluene, ethylbenzene, and xylenes (BTEX) were reported below current regulatory thresholds for the gasoline tank basin (very close proximity to former used oil UST basin). Based on regulatory data indicating adequate cleanup and removal of impacted soils and tank infrastructure in combination with laboratory confirmation samples (soil and groundwater) reporting below governing thresholds, the former USTs represent a historic REC (HREC) to the site. MCS&T operations occurred in the same general area; however, volatile/semi-volatile organic compounds (VOCs/SVOCs - solvents) were not included in laboratory analysis during the UST closures; therefore, the MCS&T operations represent a REC (solvents) to the site.

Based on regulatory status, facility characteristics and/or interpreted gradient in relation to the site, the remaining facilities identified in the database report do not present RECs to the site.

Site Reconnaissance

At the time of the site reconnaissance, Terracon observed two air compressors (40-50 gallons) and one portable 25-gallon air tank, a natural gas stove with an electric above-head ventilation hood, numerous rooftop heating, ventilation and air-conditioning (HVAC) units; numerous window AC units, typical mailroom operations including minor carpentry, a washer and dryer, a backup natural gas burner, various groundskeeping machinery, mobile storage enclosures and equipment (lawnmowers, tillers, leaf blowers, fork lifts, seed feeders, etc. – including minor equipment maintenance [e.g. oil changes]); 500-gallon gasoline and diesel above-ground storage tanks (ASTs), typical cleaning items (bleach, soaps/detergents, countertop cleaners, etc.), a cage enclosing several 25-gallon pressurized propane tanks; small containers of groundskeeping products (light duty restoration floor cleaners, weed and grass killers, pesticides, etc.); flammable liquids and fuel containers, an empty 55-gallon steel drum and two 55-gallon plastic drums of Bulkie FW (a non-carcinogenic solvent [Butoxyethanol]), at least eight stormwater drains, several interior floor drains, a subsurface pit (maintenance garage); two pad-mounted transformers and at least 11 pole-mounted transformers, various materials/debris, etc. consistent with groundskeeping staging areas (tarps, light poles, lawnmowers, pallets, etc.), one scrap metal dumpster and three other dumpsters containing typical municipal waste; stained surfaces (maintenance garage) and an apparent inactive hand pump water well.

Garage 2 (maintenance area) had a subsurface pit with a drainage pipe corridor inside. Current site operators have not utilized the pit and were not knowledgeable of its components (e.g. oil-water separators) and specific historical utilization by MCS&T. The entire ground surface was very weathered/worn and had various blotches of what appears to be aged oily stains. The staining and pit in Garage 2 constitutes a REC to the site.

Adjoining Properties

The site is adjoined to the north by the Capitol Chiller Plant (218 California Avenue), the Kanawha River Railroad and Interstate 64; to the east by Veazey Street and residences; to the south by Virginia Terrace, State Credit Union (2200 Washington Street East) and numerous residences followed by Washington Street East, the West Virginia Bureau of Employment (112 California Avenue) and West Virginia Capitol - Purchasing and Finance facilities (2019 and 2101 Washington Street East); and to the west by California Avenue/Piedmont Road and West Virginia Capitol – Division of Highways (1900 Kanawha Boulevard East).

RECs were not identified in association with current adjoining property operations.

Significant Data Gap

Significant data gaps were not identified during completion of this ESA.

Item of Environmental Note

The site has undergone extensive redevelopment since at least the late-1890s; therefore, various related subsurface features (e.g. building footings, voids, etc.) may be encountered during redevelopment activities.

Conclusions

We have performed a Phase I ESA consistent with the procedures included in ASTM Practice E 1527-13 at the site, located at 311 Jefferson Street, 312 Michigan Avenue and 2001 Washington Street East in Charleston, Kanawha County, West Virginia. The following HREC and RECs were identified:

- Regarding former USTs in the groundskeeping area, regulatory data indicated adequate cleanup and removal of impacted soils and UST infrastructure in combination with laboratory confirmation samples (soil and groundwater) reporting below current governing thresholds. Therefore, the former USTs represent a HREC.
- In at least the 1930s, an automotive repair facility operated in the northwestern portion of the site where the current Mailroom is located. The potential for hazardous substance (petroleum and solvents) impacts to the subsurface from the historical facility represent RECs.
- A fuel station operated on the northeastern corner of Michigan Avenue and Washington Street East (southeast-adjacent to the site and cross-gradient) from at least 1933-1967. No related regulatory information for this fueling station was available to further evaluate if there were/are associated impacts to the subsurface. Therefore, considering the lack of information for review, the potential for related petroleum impacts to have impacted the site represents a REC.
- MCS&T operated on the northeastern portion of the site from at least 1972-1989 (use of solvents and petroleum). Based on the timeframe of operations and potential for subsurface impacts, this historical site operator represents a REC.
- Garage 2 (maintenance area) had a subsurface pit with a drainage pipe corridor inside. Current site operators have not used the pit and were not knowledgeable of its components and specific historical use by MCS&T. Various aged oily stains were observed on the floor throughout the garage and within the pit. Based on the historical review of hazardous substance handling by MCS&T (solvents and petroleum), the pit represents a REC.

Recommendations

Based on the scope of services, limitations and conclusions of this assessment, Terracon identified RECs which warrant additional investigation (limited site investigation related to potential soil, groundwater and vapor intrusion). Additionally, if the identified well is intended for future use, it should be tested for potability. If it is not intended for future use, it should be plugged and abandoned in accordance with applicable regulations.

1.0 INTRODUCTION

1.1 Site Description

Site Name	Proposed State Capitol East Campus Redevelopment.
Site Location/Address	Comprised of 25 parcels utilizing three addresses: 311 Jefferson Street, 312 Michigan Avenue and 2100 Washington Street East in Charleston, Kanawha County, West Virginia.
Land Area	Approximately 5.2-acres.
Site Improvements	A 13,518-SF Daycare, a 5,760-SF Mailroom, a fenced groundskeeping headquarter area (eight structures: an approximately 2,500-SF tent; 1,325-SF office; 900- and 925-SF storage structures; three 650-SF tents and one 50-SF storage shed), several transformers, paved surfaces, storm drains, an inactive water well, and typical urban utilities.
Anticipated Future Site Use	Redevelop to perpetuate and expand current operations.
Purpose of the ESA	Pre-redevelopment due diligence.

The site location is depicted on Exhibit 1 of Appendix A, which was reproduced from a portion of the United States Geological Survey (USGS) 7.5-minute series topographic map. A diagram of the site and adjoining properties is included as Exhibit 2 of Appendix A. Acronyms and terms used in this report are described in Appendix F.

1.2 Scope of Services

This Phase I ESA was performed in accordance with the agreement for services signed on May 22, 2020 and was conducted consistent with the procedures included in ASTM E1527-13, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. The purpose of this ESA was to assist the client in developing information to identify RECs in connection with the site as reflected by the scope of this report. This purpose was undertaken through user-provided information, a regulatory database review, historical and physical records review, interviews, including local government inquiries, as applicable, and a visual noninvasive reconnaissance of the site and adjoining properties. Limitations, ASTM deviations, and significant data gaps (if identified) are noted in the applicable sections of the report.

ASTM E1527-13 contains a new definition of "migrate/migration," which refers to “the movement of hazardous substances or petroleum products in any form, including, for example, solid and liquid at the surface or subsurface, and vapor in the subsurface.” By including this explicit reference to migration in ASTM E1527-13, the Standard clarifies that the potential for vapor

migration should be addressed as part of a Phase I ESA. This Phase I ESA has considered vapor migration in evaluation of RECs associated with the site.

1.3 Standard of Care

This ESA was performed in accordance with generally accepted practices of this profession, undertaken in similar studies at the same time and in the same geographical area. We have endeavored to meet this standard of care, but may be limited by conditions encountered during performance, a client-driven scope of work, or inability to review information not received by the report date. Where appropriate, these limitations are discussed in the text of the report, and an evaluation of their significance with respect to our findings has been conducted.

Phase I ESAs, such as the one performed at this site, are of limited scope, are noninvasive, and cannot eliminate the potential that hazardous, toxic, or petroleum substances are present or have been released at the site beyond what is identified by the limited scope of this ESA. In conducting the limited scope of services described herein, certain sources of information and public records were not reviewed. It should be recognized that environmental concerns may be documented in public records that were not reviewed. No ESA can wholly eliminate uncertainty regarding the potential for RECs in connection with a property. Performance of this practice is intended to reduce, but not eliminate, uncertainty regarding the potential for RECs. No warranties, express or implied, are intended or made. The limitations herein must be considered when the user of this report formulates opinions as to risks associated with the site or otherwise uses the report for any other purpose. These risks may be further evaluated – but not eliminated – through additional research or assessment. We will, upon request, advise you of additional research or assessment options that may be available and associated costs.

1.4 Additional Scope Limitations, ASTM Deviations and Data Gaps

Based upon the agreed-on scope of services, this ESA did not include subsurface or other invasive assessments, vapor intrusion assessments or indoor air quality assessments (i.e. evaluation of the presence of vapors within a building structure), business environmental risk evaluations, or other services not particularly identified and discussed herein. Credentials of the company (Statement of Qualifications) have not been included in this report but are available upon request. Pertinent documents are referred to in the text of this report, and a separate reference section has not been included. Reasonable attempts were made to obtain information within the scope and time constraints set forth by the client; however, in some instances, information requested is not, or was not, received by the issuance date of the report. Information obtained for this ESA was received from several sources that we believe to be reliable; nonetheless, the authenticity or reliability of these sources cannot and is not warranted hereunder. This ESA was further limited by the following:

- Terracon requested the client to complete a provided user questionnaire adhering to ASTM E1527-13 Section 6. Terracon has not received a response at the

issuance of this report. Based on other information reviewed for this ESA, this is not considered a significant data gap.

- Historical information dated back to 1899; however, not prior to first development on the site. Based on other information reviewed for this ESA, this is not considered a significant data gap.
- The site is proposed to be redeveloped for a renewed perpetuation and expansion of current operations. Due to the proposed plans and schedules, many site items and personnel were removed from the site or unavailable. Although Terracon was limited to the perspective of a portion of remnant items/operations, the observances appeared to be a considerable representation of fully employed operations and therefore is not considered a significant data gap.
- The site had various items and features stored inside the buildings and throughout the yards (tables, chairs, mulch, pallets, equipment, etc.), which limited visual observances during the site reconnaissance. Based on other information reviewed for this ESA, this is not considered a significant data gap.
- Terracon enquired the environmental sector of the Kanawha-Charleston Health Department for their knowledge and records of ASTs/USTs, potable water wells, septic systems, hazardous substance response incidents, potential environmental impacts or concerns, etc. on the site and adjoining properties. A response remains pending. Based on other information reviewed for this ESA, this is not considered a significant data gap.

An evaluation of the significance of limitations and missing information with respect to our findings has been conducted, and where appropriate, significant data gaps are identified and discussed in the text of the report. However, it should be recognized that an evaluation of significant data gaps is based on the information available at the time of report issuance, and an evaluation of information received after the report issuance date may result in an alteration of our conclusions, recommendations, or opinions. We have no obligation to provide information obtained or discovered by us after the issuance date of the report, or to perform any additional services, regardless of whether the information would affect any conclusions, recommendations, or opinions in the report. This disclaimer specifically applies to any information that has not been provided by the client.

This report represents our service to you as of the report date and constitutes our final document; its text may not be altered after final issuance. Findings in this report are based upon the site's current utilization, information derived from the most recent reconnaissance and from other activities described herein; such information is subject to change. Certain indicators of the presence of hazardous substances or petroleum products may have been latent, inaccessible, unobservable, or not present during the most recent reconnaissance and may subsequently become observable (such as after site renovation or development). Further, these services are not to be construed as legal interpretation or advice.

1.5 Reliance

This ESA report is prepared for the exclusive use and reliance of Chapman Technical Group. Use or reliance by any other party is prohibited without the written authorization of Terracon Consultants, Inc. (Terracon).

Reliance on the ESA by the client and all authorized parties will be subject to the terms, conditions and limitations stated in the proposal, ESA report, and the signed Agreement for Services. The limitation of liability defined in the agreement is the aggregate limit of Terracon's liability to the client and all relying parties.

Continued viability of this report is subject to ASTM E1527-13 Sections 4.6 and 4.8. If the ESA will be used by a different user (third party) than the user for whom the ESA was originally prepared, the third party must also satisfy the user's responsibilities in Section 6 of ASTM E1527-13.

1.6 Client Provided Information

Terracon requested the client to complete a provided user questionnaire adhering to ASTM E1527-13 Section 6. Terracon has not received a response at the issuance of this report.

Client Questionnaire Item	Client Did Not Respond	Client's Response	
		Yes	No
Specialized Knowledge or Experience that is material to a REC in connection with the site.	X		
Actual Knowledge of Environmental Liens or Activity Use Limitations (AULs) that may encumber the site.	X		
Actual Knowledge of a Lower Purchase Price because contamination is known or believed to be present at the site.	X		
Commonly Known or Reasonably Ascertainable Information that is material to a REC in connection with the site.	X		
Obvious Indicators of Contamination at the site.	X		

It is our understanding the client is proposing to redevelop the site and continue operations similar to the current.

2.0 PHYSICAL SETTING

Physical Setting Information		Source
Topography		
Site Elevation	Approximately 600 feet above mean sea level.	USGS Topographic Maps, Charleston East and West (1/1/1996) quadrangles Appendix A
Topographic Gradient	Site is located at the toe of a hill, sloped towards the Kanawha River to the south-southwest.	
Closest Surface Water	Kanawha River located approximately 750 south of the site.	
Soil Characteristics		
Soil Type	Ue (western portion of site): Udorthents smoothed-urban land complex. Uf (central): Urban land. UC (eastern): Urban land-Fluvaquents complex.	Kanawha County, West Virginia United States Department of Agriculture (USDA)-Natural Resource Conservation Service (NRCS) Online Web Soil Survey Reviewed in June 2020
Description	Generally, irrigated/urbanized land underlaid by fine-loamy alluvium derived from sedimentary rock.	
Geology/Hydrogeology		
Formation	Quaternary Alluvium.	References: Cardwell, D.H., Erwin, R.B., and Woodward, H.P., 1968 (slightly revised 1986), Geologic Map of West Virginia: West Virginia Geological and Economic Survey, Map 1, East Sheet, scale 1:250,000.
Description	Alluvial deposits of sand, gravel, silt and clay.	
Estimated Depth to First Occurrence of Groundwater	During a seasonal high-level fluctuation, as shallow as 5 feet below grade surface (bgs).	Terracon's experience in the site vicinity
*Hydrogeologic Gradient	Not known - may be inferred to be parallel to topographic gradient (primarily to the south-southwest).	

* The groundwater flow direction and the depth to shallow, unconfined groundwater, if present, would likely vary depending upon seasonal variations in rainfall and other hydrogeological features. Without the benefit of on-site groundwater monitoring wells surveyed to a datum, groundwater depth and flow direction beneath the site cannot be directly ascertained.

3.0 HISTORICAL USE INFORMATION

Terracon reviewed the following historical sources to develop a history of the previous uses of the site and surrounding areas. Copies of selected historical documents are included in Appendix C.

3.1 Topographic Maps, Aerial Imagery, and Sanborn Maps

Readily available historical USGS topographic maps, selected historical aerial photographs (at approximately 10- to 15-year intervals) from Environmental Data Resources Inc. (EDR) and historical fire insurance maps produced by the Sanborn Map Company were reviewed to evaluate land development and obtain information concerning the history of development on and near the site. Reviewed historical topographic maps, aerial photographs and Sanborn Maps are summarized below.

- Topographic map: Charleston, West Virginia, published in **1899** (1:125,000); Charleston, West Virginia, published in **1909**, **1931** and **1935** and revised in **1952** from 1952 imagery (1:62,500); and Charleston East/West, West Virginia, revised in 1957 and 1958 from **1955** imagery, revised in 1971 from **1971** imagery, revised in 1976 from **1976** imagery, revised in 1996 from **1996** imagery and published in 2014 (1:24,000).
- Aerial photograph: USGS, **1955**, **1960**, **1971**, **1977** and **1996**; USDA, **1986**; USGS/DOQQ, **1990**; USDA/NAIP, **2007**, **2011** and **2016** (1″ = 500′) and Google Earth, various years and scales.
- Sanborn Fire Insurance Map(s): Eastern maps – **1933**, **1950**, **1972** and **1989**; Western maps – **1912**, **1933**, **1950**, **1972** and **1989**.

Direction	Description
Site	Resolution quality for the 1899 topographic map was poor and features were obscure; however, numerous structures are depicted throughout the site and two north-south oriented roads (currently Jefferson Street and Michigan Avenue) intersect through the central portion by at least 1909. By 1933, identifiable/labeled developments include over 25 dwellings and a few apartment complexes throughout, some with associated garages and sheds (ongoing configurations thereafter). Moreover, an unidentified automotive repair shop was on the northwestern portion while the Capitol School is on the south-central portion and Virginian Electric, Inc. on the eastern portion. By 1950, a wholesale hardware facility took over and the building of the automotive repair shop. By 1972, an open deck garage operated on the northwestern corner and a different unidentified automotive repair shop and the MCS&T occupied the general area where Virginian Electric, Inc. was historically located. By 1989, offices occupied an area formerly developed with dwellings (near the wholesale hardware facility). Moreover, the school is no longer depicted; however, the building remained in place. Ground disturbances and demolition/redevelopment occurred until approximately 2007-2009, which is when the configuration appears to remain consistent (paved parking lots, one structure on the western portion, one structure in the south-central portion, and eight structures on the eastern portion).

Direction	Description
North	A northwest-southeast oriented railroad (Kanawha River Railroad) and road (currently Interstate 64) has bordered the site since at least 1899. By 1933, several dwellings adjoin the northwestern corner, south-adjoining to the railroad. An armory appears near those dwellings by 1950, which is converted into State Roads Commission offices by 1972. The dwellings were removed between 2007 and 2010, which is the general configuration of the area through at least 2016.
East	A northwest-southeast oriented railroad (Kanawha River Railroad) and road (currently Interstate 64) has bordered the site since at least 1899. Since at least 1933, a north-south oriented road (currently Veazey Street) and dwellings have adjoined the site.
South	Resolution quality for the 1899 topographic map was poor and features were obscure; however, the adjoining areas appear undeveloped. By 1909, an east-west oriented road (currently Washington Street East) borders the site and is followed by urban city block development comprised of roads and structures while the eastern portion of the site is bordered by structures before reaching Washington Street East. By 1933, identifiable/labeled developments include dwellings and apartment complexes which generally remained until at least 1950. Moreover, from at least 1933 through at least 1950, a gasoline filling station utilizing at least three USTs is located adjacent to the southeastern corner of the site along Michigan Avenue. The fuel station was demolished by 1972 and redeveloped with a new structure by 1986. Moreover, by 1972, various buildings were developed south-adjacent to the western portion of the site. Since then, ongoing redevelopment in the general area includes dwellings and commercial buildings.
West	Resolution quality for the 1899 topographic map was poor and features were obscure; however, the adjoining areas were undeveloped. By 1909, a north-south oriented road (currently California Avenue/Piedmont Road) has bordered site and is followed by urban city block development comprised of roads and structures. Dwellings border the western side of California Avenue through at least 1950. The general area is redeveloped as larger commercial buildings by 1972, which appears to be the same general adjoining/adjacent configurations through at least 2016.

In at least the 1930s, an automotive repair facility operated in the northwestern portion of the site where the current Mailroom is located. The potential for hazardous substance (petroleum and solvents) impacts to the subsurface from the historical repair facility presents a REC to the site.

An unidentified fuel station is depicted on Sanborn maps at the northeastern corner of Michigan Avenue and Washington Street East (southeast-adjacent to the site and cross-gradient) from at least 1933-1950. No related regulatory information for this fueling station was available to further evaluate if there were/are associated impacts to the subsurface or if cleanup activities have occurred. Therefore, considering the lack of information for review, the potential for related petroleum impacts to have impacted the site represents a REC to the site.

MCS&T operated on the northeastern portion of the site from at least 1972-1989 (documented use of solvents and petroleum, see Section 4.1). Based on the timeframe of operations and known solvent and petroleum use, this historical site operator represents a REC to the site.

3.2 Historical City Directories

The EDR Digital Archive and Polk's City Directory data studied for this assessment was provided by EDR (selected year[s] readily available for review: 1963 – 2017). Street listings were not available prior to 1963. Based on a review of the Sanborn maps, the site has had several historical addresses; however, features/facilities for those potential addresses have been evaluated and appropriately described in section 3.1 above. Therefore, this section focuses on the current site addresses (311 Jefferson Street, 312 Michigan Avenue and 2100 Washington Street East). Additionally, due to the extensive redevelopment history of the site and surrounding areas, the surrounding areas were fully evaluated up to 500 feet from the site; however, only the site and immediately adjoining/adjacent properties have been described below.

Direction	Description
Site	**2100 Washington Street East:** Capitol School (1967); State Commission on Aging (1978); State Building Risk and Management (1983); State Insurance Commission (1983 and 1987) and State Fire Commission (1992). **311 Jefferson Street:** Charleston Light Opera Guild Workshop and Children's Theatre (1983 and 1987). **312 Michigan Avenue:** MCS&T (1963-1987 and 1995 – see discussion below table) and Contract Administration (2005). ***No listings:** 1963, 2000, 2010, 2014 and 2017.
North	***No listings:** 1963-2017.
East	***No listings:** 1963-2017.
South	**1924 - 2205 Washington Street East:** various retailers, community attractions and governmental/administrative firms (Home Mission Church, Bethany Baptist Church, Capitol Sweeper and Vacuum, State of Emergency Planning, Appalachian Council, Magnet Bank, State Insurance, State Credit Union, etc. [1963-2017]). Of these listings, Chandler's Texaco fueling station (building 2200) was located southeast-adjacent to the site (1967 – see discussion below table).
West	***No listings:** 1963-2017.

***No listings:** No listings, or, listings are either residential, unknown, previously described by Sanborn map evaluations, or located beyond properties adjoining to the site.

As previously described in section 3.1 above, MCS&T operated on the northeastern portion of the site for a significant timeframe (city directory-specific data: at least 1963-1987 and 1995). The potential for subsurface impacts of petroleum and solvents from this historical site operator represents a REC to the site.

Chandler's Texaco operated on the southeast-adjacent property (cross-gradient to the site) in at least 1967 (aerial imagery indicated this facility to be redeveloped shortly after these operations). Terracon anticipates this operator to be the same operator identified as a fueling station in section

3.1 above (1930 to at least 1950). This historical southeast-adjacent operator represents a REC to the site.

3.3 Site Ownership

Based on a review of information obtained from the online Kanawha County Assessor Property Viewer records, the site is comprised of 24 lots and a portion of another (25 lots total) for a combined area of approximately 5.2 acres.

General Location	Parcel ID	Current Owner	Size (acres)
East of California Avenue	11 28007900000000	WEST VA STATE BLDG COMM	1.1 (portion)
East of Alley	11 28008500000000	WEST VA STATE BLDG COMM	0.12
East of Alley	11 28008600000000	WEST VA DEPT OF ADMIN REAL EST DIV	0.13
East of Alley	11 28008700000000	WEST VA DEPT OF ADMINISTRATION	0.13
*East of Alley	11 28008800000000	WEST VA DEPT OF ADMINISTRATION	0.13
East of Alley	11 28008900000000	WEST VA DEPT OF ADMINISTRATION	0.10
East of Alley	11 28009000000000	WEST VA DEPT OF ADMINISTRATION	0.15
East of Alley	11 28009100000000	WEST VA DEPT OF ADMINISTRATION	0.15
East of Alley	11 28009200000000	WEST VA DEPT OF ADMINISTRATION	0.04
East of Alley	11 28009300000000	WEST VA DEPT OF ADMINISTRATION	0.09
East of Alley	11 28009400000000	WEST VA DEPT OF ADMINISTRATION	0.06
East of Alley	11 28009500000000	WEST VA DEPT OF ADMINISTRATION	0.06
East of Alley	11 28009600000000	WEST VA DEPT OF ADMINISTRATION	0.06
East of Alley	11 28009700000000	WEST VA DEPT OF ADMINISTRATION	0.07
*East of Jefferson Street	11 28009800000000	WEST VA STATE BLDG COMM	0.67
East of Jefferson Street	11 28009900000000	WEST VA STATE BLDG COMM	0.07
East of Jefferson Street	11 28001000000000	WEST VA STATE BLDG COMM	0.07
East of Jefferson Street	11 28001010000000	WEST VA DEPT OF ADMINISTRATION	0.07

East of Jefferson Street	11 28001020000000	WEST VA STATE BLDG COMM	0.19
East of Jefferson Street	11 28001030000000	WEST VA STATE BLDG COMM	0.08
East of Jefferson Street	11 28001040000000	WEST VA STATE BLDG COMM	0.07
East of Jefferson Street	11 28001050000000	WEST VA STATE BLDG COMM	0.07
East of Jefferson Street	11 28001060000000	WEST VA DEPT OF ADMIN REAL EST DIV	0.08
East of Michigan Avenue	11 28001070000000	WEST VA DEPT OF HWYS	0.83
*East of Michigan Avenue	11 28001070010000	WEST VA DEPT OF ADMIN REAL EST DIV	0.61

*Parcel is developed with at least one structure.

3.4 Title Search

At the direction of the client, a title search was not included as part of the scope of services. Unless notified otherwise, we assume that the client is evaluating this information outside the scope of this report.

3.5 Environmental Liens and Activity and Use Limitations

Environmental lien and activity and use limitation records recorded against the site were not provided by the client. At the direction of the client, performance of a review of these records was not included as part of the scope of services and unless notified otherwise, we assume that the client is evaluating this information outside the scope of this report. While not requested by the client, the EDR regulatory database report included a review of both Federal and State Engineering Control (EC) and Institutional Control (IC) databases. Based on a review of the database report, the site is not listed on the EC or IC databases. Review of this information does not constitute an environmental lien/AUL search per ASTM E1527-13. Please note that in addition to these federal and state listings, AULs can be recorded at the county and municipal level that may not be listed in the regulatory database report.

3.6 Interviews Regarding Current and Historical Site Uses

Interviewer	Name / Phone #	Title	Date/Time
Mr. Levi J. Sheff Terracon	Mr. Mark Crites (304) 881-3756	Owner Representative West Virginia Department of Administration	May 28, 2020 9:00 AM and June 11, 2020 10:00AM

Mr. Crites provided a general tour of the facility and provided additional information after the site visit. The following information was obtained from Mr. Crites and his team (West Virginia Department of Administrations – ‘they’):

- They have been associated with the site for a little over 10 years, acquired from the West Virginia Division of Highways.
- Aside from the assumed inactive well discussed in section 5.0, they are unaware of past/present wells or septic systems, or current USTs on the site.
- Aside from the historical UST removals, they are unaware historical spills, releases, environmental incidents or hazardous materials responses to the site. Likewise, for any pending, threatened or past environmental litigation, proceedings or notices of possible violations of environmental laws or liability or potential environmental concerns in connection with the site.
- Additional information has been provided; however, the information is presented in appropriate areas of this report (e.g. AST information is in Section 5.0 under ASTs discussion).

3.7 Prior Report Review

Terracon requested the client to provide previous reports they have for the site. Previous reports were not provided to Terracon for review.

4.0 RECORDS REVIEW

Regulatory database information was provided by EDR, a contract information services company. The purpose of the records review was to identify RECs in connection with the site. Information in this section is subject to the accuracy of the data provided by the information services company and the date at which the information is updated. The scope herein did not include confirmation of facilities listed as "unmappable" by regulatory databases.

In some of the following subsections, the words up-gradient, cross-gradient and down-gradient refer to the topographic gradient in relation to the site. As stated previously, the groundwater flow direction and the depth to shallow groundwater, if present, would likely vary depending upon seasonal variations in rainfall and the depth to the soil/bedrock interface. Without the benefit of site groundwater monitoring wells surveyed to a datum, groundwater depth and flow direction beneath the site cannot be directly ascertained.

4.1 Federal and State/Tribal Databases

Listed below are the facility listings identified on federal and state/tribal databases within the ASTM-required search distances from the approximate site boundaries. Database definition, descriptions, and the database search report are included in Appendix D.

Federal Databases

Database	Description	Distance (miles)	Listings
SEMS (formerly CERCLIS)	Superfund Enterprise Management System (formerly Comprehensive Environmental Response, Compensation, & Liability Information System)	0.5	1
SEMS ARCHIVE (formerly CERCLIS / NFRAP)	Formerly Comprehensive Environmental Response, Compensation, & Liability Information System/No Further Remedial Action Planned	0.5	0
ERNS	Emergency Response Notification System	Site	0
IC / EC	Institutional Control/Engineering Control	Site	0
NPL	National Priorities List	1	0
NPL (Delisted)	National Priorities Delisted List	0.5	0
RCRA CORRACTS/ TSD	RCRA Corrective Action Activity	1	0
RCRA Generators	Resource Conservation and Recovery Act	Site and adjoining properties	2
RCRA Non-CORRACTS/ TSD	RCRA Non-Corrective Action Activity	0.5	0

State/Tribal Databases

Database	Description	Distance (miles)	Listings
Brownfields	Brownfields Sites	0.5	0
IC	Institutional Controls Sites	Site	0
AST	Aboveground Storage Tanks	Site and adjoining properties	0
UST	Underground Storage Tanks	Site and adjoining properties	2
LUST	Leaking Underground Storage Tanks	0.5	3
RGA LUST	Recovered Government Archive Leaking Underground Storage Tanks	0.5	0
LTANKS	Leaking Tanks	0.5	0
SPILLS	Spills Listing	0.5	0
SHWS	State Hazardous Waste Sites	0.5	0
SWF/LF	Solid Waste Facilities/Landfills	0.5	0

Database	Description	Distance (miles)	Listings
RGA LF	Recovered Government Archive Solid Waste Facilities List	0.5	0
LCP	Landfill Closure Program	0.5	0
VCP	Voluntary Cleanup Program	0.5	0
UIC	Underground Injection Wells	0.5	0
NPDES	Wastewater Discharge Permits Listing	Site and adjoining properties	0
MINES	MINES	0.5	0
Daycare Centers	Sensitive Receptor: Day Care Center List	0.5	0
DRYCLEANERS	Listing of Drycleaner Locations	0.5	0
COAL ASH	Coal Ash Landfills	0.5	0
CDL	Drug Lab Site Locations	0.5	0
ASBESTOS	ASBESTOS	Site	0
AIRS	Permitted Facility and Emissions Listing	Site and adjoining properties	0
Financial Assurance	Financial Assurance Information Listing	Site and adjoining properties	0
State Wetlands	Wetland Inventory	Site and adjoining properties	0
Various	Various Other Ascertainable Records	Site-0.5	0

In addition to the above ASTM-required listings, Terracon reviewed other federal, state, local and proprietary databases provided by the database firm. The following table summarizes site-specific information provided by the database and/or gathered by this office for facilities identified within 500 feet of the site (reflected in the table below). Facilities are listed in order of proximity to the site and cross-referenced for accuracy utilizing various resources. A list of the facility listings and reviewed databases is included in the regulatory database report attached in Appendix D.

Facility Name and Location	Estimated Distance / Direction/Gradient	Database Listings	Is a REC, CREC, or HREC to the Site
MCS&T – WV Division of Highways 312 Michigan Avenue	Eastern portion of site	RCRA NonGen/NLR ECHO WV UST	RECs
DOH Central Motor Pool 01701 212 California Avenue	South-adjacent / down-gradient	WV UST	None

MCS&T – WV Division of Highways

This facility is reported in the RCRA NonGen/NLR and ECHO databases in at least 1987, 1991 and 2003 for historically generating a small quantity of halogenated/non-halogenated solvents (no reported violations). Additionally, the facility historically utilized a 6,000-gallon gasoline UST (1996-1990) and a 1,000-gallon used oil tank (1966-1992) located by the eastern and southeastern exterior of the current Groundskeeping Office. There was reported evidence of leaks from the gasoline tank and approximately 50 gallons of free product from the oil tank during tank/piping removals. The impacted soils were sampled to at least 11 feet bgs and impacted materials were excavated for proper handling and disposal. The site received closures (IDs: C-2511-92 and C-720-90) in 1990 and 1992. The horizontal and vertical extents of the excavated basins were sampled (soils) and analyzed for associated TPH – gasoline range and oil range organics. TPH concentrations were below the laboratory reporting limit in the used oil tank basin and TPH ranged from 37-91 mg/kg in the gasoline tank basin, which is below the current 100 mg/kg guidance threshold. Moreover, groundwater sample concentrations of TPH and BTEX from the gasoline tank basin were reported below current regulatory thresholds (former UST basins were in very close proximity to each other). Based on regulatory data indicating adequate cleanup and removal of impacted soils and tank infrastructure in combination with laboratory confirmation samples (soil and groundwater) reporting below current governing thresholds, the historical USTs present a HREC to the site. Additionally, MCS&T operations occurred in the same area these tanks were located and laboratory analysis did not include testing for solvents during the UST closures; therefore, historical MCS&T operations present a REC to the site.

DOH Central Motor Pool 01701

This facility is reported in the WV UST database for historically utilizing one 4,000-gallon and two 6,000-gallon gasoline USTs and one 500-gallon used oil tank. The tanks were removed from the ground in 1998 except for one of the 6,000-gallon gasoline UST, which was removed in 1992. A closure (ID: C-57443-98) from 1998 noted no leak detections or residual impacts above governing thresholds from the tank basins upon their removals. Based on the down-gradient position of this property across Washington Street, it does not represent a REC in connection with the site.

Based on regulatory status, facility characteristics and/or interpreted gradient in relation to the site, the remaining facilities identified in the database report do not present RECs to the site.

Unmapped facilities are those that do not contain sufficient address or location information to evaluate the facility listing locations relative to the site. The database report listed four orphan facilities in the unmapped section. Determining the location of unmapped facilities is beyond the scope of this assessment; however, they were not identified as the site or on an adjoining property. These facilities are listed in the database report in Appendix D.

4.2 Local Agency Inquiries

Terracon inquired to the following agencies for their knowledge and records of ASTs/UST, potable water wells, septic systems, hazardous substance response incidents, potential environmental

impacts or concerns, etc. on the site and adjoining properties. The following information was received in response to the inquiries:

Agency Contacted/ Contact Method	Response
Charleston, West Virginia - Fire Department Online Platform	Reported no information indicating historical response incidents or concerns for the site.
Kanawha-Charleston Health Department - Environmental By email: Environmental@kchdwv.org.	A response remains pending.
Kanawha County Assessor By email: SallieRobinson@kanawha.us	311 Jefferson Street (Mailroom): 5,760 SF, constructed in 1930. Further information was not documented due to associated tax exemptions/limitations.
West Virginia Flood Map Tool Online Platform	302 Jefferson Street (Daycare): 4,506 SF (three floor levels), constructed in 1936. 312 Michigan Avenue: information is not available for the current groundskeeping office/area.
West Virginia Department of Environmental Quality (DEQ) – Freedom of Information Act (FOIA) By email: Terry.A.Fletcher@wv.gov	WVDEQ provided regulatory file information for the USTs discussed above in section 4.1.

5.0 SITE RECONNAISSANCE

5.1 General Site Information

Information contained in this section is based on a visual reconnaissance conducted while walking through the site and the accessible interior areas of structures, if any, located on the site. The site and adjoining properties are depicted on the Site Diagram, which is included in Exhibit 2 of Appendix A. Photo documentation of the site at the time of the visual reconnaissance is provided in Appendix B. Credentials of the individuals planning and conducting the site visit are included in Appendix E.

Site Reconnaissance				
Field Personnel	Levi J. Sheff, AEP, CNRP			
Reconnaissance Date	May 28, 2020			
Weather Conditions	Sunny, 85°F			
Site Contact/Title	Mark Crites | Project Manager (WV Dep. of Admin.)			
Building Description				
Building Identification	**Building Use**	**Approx. Construction Date**	**Number of Stories**	**Approx. Size (ft²)**
Mailroom	Offices, Storage, Mail Distribution and Limited Carpentry	1930	1	5,760
Daycare	Childcare and Entertainment	1936	3	13,518
Groundskeeping Office	Office Space	2009	1	1,325
Tent 1	Lawnmowers and Germinating/Potted Flowers/Plants	2009	1	650
Tent 2	General Groundskeeping Machinery/Equipment	2009	1	650
Tent 3	General Groundskeeping Machinery/Equipment	2009	1	650
Tent 4	Groundskeeping Products	2009	1	2,500
Garage 1	Worker Equipment (Weed Wacker's, Leaf Blowers) and Prepackaged Potting Materials/Seeds	2007	1	900
Garage 2	Equipment Storage and Minor Maintenance	1995	1	925
Shed	Various (Shovels, High-Reflective Cones, Signage, Etc.)	1995	1	50
Site Utilities				
Drinking Water/Wastewater	City of Charleston			
Electric	American Electric Power (AEP)			
Natural Gas	Mountaineer Gas Corporation (MGC)			

5.2 Overview of Current Site Occupants and Operations

The site is comprised of 24 mostly paved lots and a 1.1-acre portion of another lot (25 lots total) for a total area of approximately 5.2-acres. There are three addresses currently associated with

the site (2001 Washington Street East - Daycare, 311 Jefferson Street – Mailroom, and 312 Michigan Avenue Groundskeeping Office).

5.3 Overview of Current Site Operations

There are three operations currently associated with the site. The first operation is a 4,506 SF three story Daycare located at 2001 Washington Street East, the second is a 5,760-SF Mailroom which also includes minor carpentry activities (e.g. cabinets, shelving, etc.) located at 311 Jefferson Street and the third is a groundskeeping headquarter area (administrating, staging/storage, maintenance, etc.) serving the City of Charleston, improved with eight structures: an approximately 2,500-SF tent; a 1,325-SF office; 900- and 925-SF storage structures; three 650-SF tents and one 50-SF storage shed (312 Michigan Avenue).

5.4 Site Observations

The following table summarizes site observations and interviews. Affirmative responses (designated by an “X”) are discussed in more detail following the table.

Category	Item or Feature	Observed or Identified
Site Operations, Processes, and Equipment	Emergency generators	
	Elevators	
	Air compressors	X
	Hydraulic lifts	
	Dry cleaning	
	Photo processing	
	Ventilation hoods and/or incinerators	X
	Waste treatment systems and/or water treatment systems	
	Heating and/or cooling systems	X
	Paint booths	
	Sub-grade mechanic pits	
	Wash-down areas or carwashes	
	Pesticide/herbicide production or storage	X
	Printing operations	
	Metal finishing (e.g., electroplating, chrome plating, galvanizing, etc.)	
	Salvage operations	
	Oil, gas or mineral production	
	Other processes or equipment	X
	Aboveground storage tanks	X

Category	Item or Feature	Observed or Identified
Aboveground Chemical or Waste Storage	Drums, barrels and/or containers ≥ 5 gallons	X
	MSDS or SDS	
Underground Chemical or Waste Storage, Drainage or Collection Systems	Underground storage tanks or ancillary UST equipment	
	Sumps, cisterns, French drains, catch basins and/or dry wells	X
	Grease traps	
	Septic tanks and/or leach fields	
	Oil/water separators, clarifiers, sand traps, triple traps, interceptors	
	Pipeline markers	X
	Interior floor drains	X
Electrical Transformers/ PCBs	Transformers and/or capacitors	X
	Other equipment	
Releases or Potential Releases	Stressed vegetation	
	Stained soil	
	Stained pavement or similar surface	X
	Leachate and/or waste seeps	
	Trash, debris and/or other waste materials	X
	Dumping or disposal areas	
	Construction/demolition debris and/or dumped fill dirt	X
	Surface water discoloration, odor, sheen, and/or free floating product	
	Strong, pungent or noxious odors	
	Exterior pipe discharges and/or other effluent discharges	
Other Notable Site Features	Surface water bodies	
	Quarries or pits	
	Wastewater lagoons	
	Wells	X

Site Operations, Processes, and Equipment

Air compressors

One approximately 40-gallon air compressor was bolted on railings secured to a concrete pedestal in the basement of the Daycare. It was also connected to natural gas. Moreover, a 50-gallon air compressor and a portable 25-gallon air tank were observed in Garage 2 (maintenance area). Evidence of historical or recent fluid releases were not observed on the compressors/tanks.

Ventilation hoods

The kitchen in the basement of the Daycare was equipped with one natural gas stove and an above-head electric hood exhausting above the rooftop of the structure through ventilation, which is not subject to permitting. No hazardous materials were observed on/near the hood.

Heating and/or cooling systems

Heating to the Daycare, Mailroom and Groundskeeping Office is through modern furnaces using natural gas. Four above-head forced air units were in the western and eastern garage spaces of the Mailroom (includes carpentry area) and one was in the restroom of Garage 2. Numerous HVAC units circulate air to the buildings except for the Groundskeeping Office. The Groundskeeping Office had numerous window AC units for cooling, and additionally, the Daycare also had window AC units available for voluntary use. Additionally, there was a freezer located on the northwestern exterior of the Daycare. Indications of hazardous substance releases (i.e. stains, stressed vegetation, odors, etc.) were not observed near these features.

Other Processes of Equipment

The internal Mailroom included typical mail assembly operations where trucks would deliver bulk mailings into the above-grade loading areas/garage bays which is then organized in bins for proper redistribution by truck. The facility has a lobby, mailboxes and an area in the western portion where minor carpentry work occurs (cabinets, shelving, trim, etc.). Some former remnant features of the historical automotive repair facility were observed (concrete markings/weathering of former infrastructure).

The Daycare was equipped with a washer and dryer for minor use, and a backup natural gas burner was in the basement. The burner is operable and no known historical malfunctioning incidents have occurred.

There were various groundskeeping machinery, mobile storage enclosures and equipment stored throughout the groundskeeping yard, tents and garages (lawnmowers, tillers, leaf blowers, fork lifts, seed feeders, etc.). The equipment appeared generally well maintained and indicators of releases was not observed on/by the machinery/equipment.

Machinery/equipment maintenance occurs inside Garage 2 (east of the Groundskeeping Office). Reportedly, maintenance is minor (small engine tweaking, changing oil, etc.). Used oils were stored inside a covered 55-gallon drum located on a secondary containment pallet on the eastern exterior of the Groundskeeping Office. Safety Kleen transfers and disposes contents on a demand basis (reportedly rare/infrequently). The current maintenance operations appear minor and for short term and are not a REC; however, building components were from historical operators, which included a subsurface drainage pit. See interior drains section below for further details.

Above-ground Chemical or Waste Storage

ASTs

Terracon observed the following ASTs during the reconnaissance:

Location	Contents	Quantity/Size (gallons) and Material	Associated Staining	Secondary Containment	Approximate Installation
Groundskeeping Area	Diesel	(1) 500 Pre-cast pebble/concrete	Yes	No	2012
	Gasoline	(1) 500 Pre-cast pebble/concrete	Yes	No	2012

Reportedly, the bulk ASTs are refilled on demand. Reportedly, there have been no damages to the tanks and they have not had a release incident. The tanks appeared in good condition and are without a reportable release, drips and similar types of spills (refilling seeps/fittings upon fuel transfers, etc.). Therefore, no REC is identified.

Drums, barrels and/or containers ≥ 5 gallons

Most of the typically stored cleaning items (bleach, soaps/detergents, countertop cleaners, etc.) were already removed from the facilities; however, some remnant items were observed in restrooms and custodial areas. There was a cage in the northwestern portion of the groundskeeping yard enclosing several 25-gallon pressurized propane tanks (forklift use - stressed vegetation was not observed by the enclosure). Pallets of 5-gallon paints, thinners, acrylic latex, etc. were observed in the groundskeeping tents.

Small containers of light duty restoration floor cleaners, weed and grass killers, pesticides, and other groundskeeping products were observed in the Groundskeeping Office and somewhat distributed in the groundskeeping tents and associated yard. Some were stored inside typical metal cabinets similar to the three observed cabinets enclosing flammable liquids and fuel containers inside Tent 4 by the southern fence line.

An empty 55-gallon steel drum was observed over an empty plastic secondary containment bin by the eastern exterior of the Groundskeeping Office by the equipment maintenance garage. Two 55-gallon plastic drums of Bulkie FW (a liquid additive containing a non-carcinogenic solvent [Butoxyethanol]) were observed in Tent 4. The empty 55-gallon drum is reportedly for storage of used oil changes until Safety Kleen manages transfer/disposal.

Evidence of hazardous substance releases was not observed on or near these items, no RECs were identified.

Underground Chemical or Waste Storage, Drainage or Collection Systems

Stormwater drains and surface water body

Terracon observed at least eight stormwater drains located throughout the parking lots and along the borders of the site and beneath Tent 2 in the Groundskeeping area. Evidence of hazardous substances was not observed stored next to the drains or emanating from the drains.

Pipeline Marker

A pipeline marker was not observed; however, recent West Virginia 811 public utility paint markings indicated natural gas lines in various places (generally roadways) throughout the sight (some yellow paint depictions appeared weathered).

Interior floor drains

Most drains in the site structures (Daycare, Mailroom and Groundskeeping) were directly piped to the municipal sanitary system. However, interior floor drains were observed in the basement and custodial closet of the Daycare and the storage garage of the Mailroom which reportedly connect to the municipal sanitary system. Indications of hazardous substance storage or releases were not observed near those drains.

Additionally, Garage 2 (maintenance area) had a subsurface pit with a drainage pipe corridor inside. Site operators have not used the pit and were not knowledgeable of its components and specific historical use by MCS&T. It is unknown where the pipe discharges. Based on the historical review of hazardous substance utilization by MCS&T (solvents and petroleum), the pit presents a REC to the site.

Electrical Transformers/PCBs

Transformers and/or capacitors

Two pad-mounted transformers, apparently owned by Federal Pacific, were observed on the eastern side of the northern extent of Jefferson Street (north-central portion of the site). At least 11 pole-mounted transformers were observed generally along Jefferson Street, Michigan Avenue and Virginia Terrace (generally, the southern and eastern portions of the site).

Some transformers contain mineral oil, which may contain polychlorinated biphenyls (PCBs); labels indicating potential PCB content were not observed on the transformers. The owner of the transformers maintains responsibility of fluid-containing transformers; and if transformers are "PCB contaminated," they are not required to flush and change their fluids unless a release is identified. Evidence of releases was not observed near the transformers.

Stained pavement or similar surface

The entire ground surface was very weathered/worn inside the maintenance garage (Garage 2) and had various blotches of what appears to be aged stains. The weathering and oily blotches represent a REC to the site.

Trash, debris and/or other waste materials

Various items consistent with groundskeeping staging areas (tarps, light poles, lawnmowers, pallets, fenceposts, gardening [seeded plants, pots, soils] etc.) were observed inside the northern and eastern fence line by the Groundskeeping Office and storage shed. An unused and weathered/damaged/aged HVAC unit was observed by the southern fence line. Indications of hazardous substances/material releases were not observed.

Construction/demolition debris and/or dumped fill dirt

There were three concrete enclosed barricades with either stockpiled gravel, soils, grass cuttings, and similar grounds composting organics (from the complex grounds: trees, flower beds, shrubbery beds, leaves in the fall etc.) within the southern fence line of the Groundskeeping yard. There were construction/building materials such as bricks, pallets, concrete masonry-unit blocks, shaped slab, etc. throughout the groundskeeping yard and along the northern boundary of the eastern portion of the site. Indications of hazardous substances/materials were not observed.

Releases or Potential Releases

Waste disposal

Numerous various sized (25-50 gallon) trash cans containing typical municipal waste (wrappers, paper, etc.) were observed throughout the Daycare, Mailroom and Groundskeeping areas. Two outdoor trash cans were observed; one was along the east-central border of the site (along California Avenue/Piedmont Road) and the other by the northeastern exterior of the Daycare.

One scrap metal dumpster, serviced on a demand basis, was in the northwestern portion of the fenced groundskeeping area. Materials were consistent with scrap metals (cables, wires, panels, pipes, etc.) with a periodic spray paint can or similar item (*de minimis)*. Additionally, one Waste Management dumpster was located by the northeastern exterior of the Daycare and two additional dumpsters were along the eastern interior of the fenced Groundskeeping yard (one had typical waste in trash bags while the other contained larger items of non-hazardous waste such as wooden pallets or fallen tree branches from recent storms, etc.). They are serviced on a weekly basis.

Evidence of staining, noxious odors, or hazardous waste disposal was not observed within or near the municipal waste bins or dumpsters.

Other Notable Site Features

Wells

An apparent hand pump and assumed water well was observed along the fence by the Groundskeeping storage shed. Reportedly, the current owners have not used the assumed well and reported it to be inactive. Further information about confirming the feature as a potable water well, or as another feature, and its formation specs was not known or readily available (installation, specifications, static water level, etc.). If the well is intended for future use, it should be tested for

potability. If it is not intended for future use, it should be plugged and abandoned in accordance with applicable regulations.

6.0 ADJOINING PROPERTY RECONNAISSANCE

Direction	Description
North	The Capitol Chiller Plant (218 California Avenue), a northwest-southeast oriented railroad (Kanawha River Railroad) and Interstate 64.
East	A north-south oriented road (Veazey Street) and residences.
South	An east-west oriented road (Virginia Terrace), State Credit Union (2200 Washington Street East) and numerous residences followed by Washington Street East, the West Virginia Bureau of Employment (112 California Avenue) and West Virginia Capitol - Purchasing and Finance facilities (2101 and 2019 Washington Street East).
West	A north-south oriented road (California Avenue/Piedmont Road) and West Virginia Capitol – Division of Highways (1900 Kanawha Boulevard East).

RECs were not identified in association with current adjoining property operations.

7.0 ADDITIONAL SERVICES

Per the agreed scope of services specified in the proposal, additional services (e.g. asbestos sampling, lead-based paint sampling, wetlands evaluation, lead in drinking water testing, radon testing, vapor encroachment screening, etc.) were not conducted.

8.0 DECLARATION

I, Levi J. Sheff, declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in Section 312.10 of 40 CFR 312; and I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the site. I have developed and performed the All Appropriate Inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.



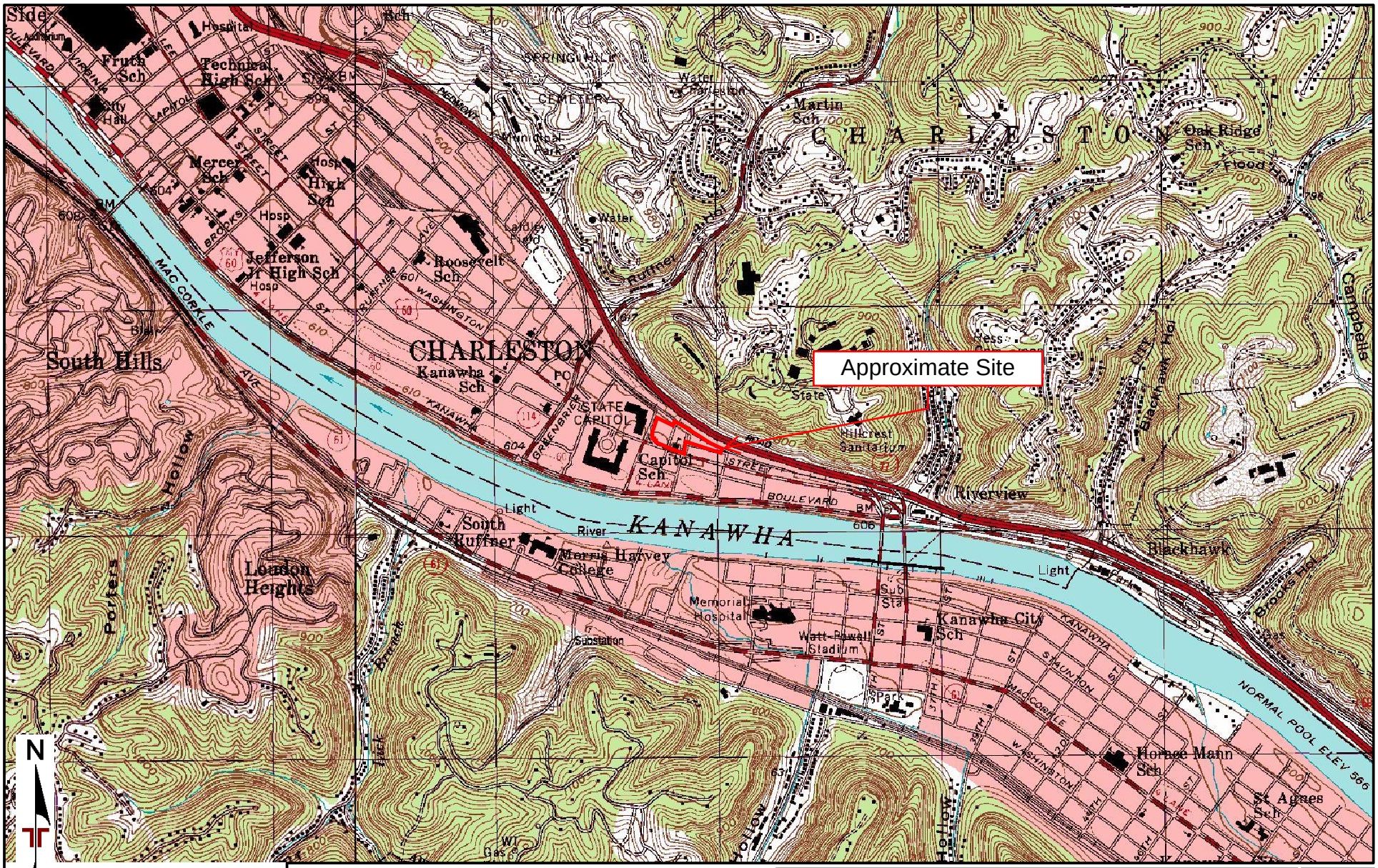
Levi J. Sheff, AEP, CNRP
Sr. Staff Scientist

APPENDIX A

EXHIBIT 1 – TOPOGRAPHIC MAP

EXHIBIT 2 – SITE AREA MAP

EXHIBIT 3 – SITE DIAGRAM



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: CHARLESTON WEST, WV (1/1/1996) and CHARLESTON EAST, WV (1/1/1996).

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	LJS
Drawn by:	LJS
Checked by:	JBS
Approved by:	JBS

Project No.	N2207015
Scale:	1"=2,000'
File Name:	Exhibits
Date:	6/9/2020

Terracon

912 Morris St

Charleston, WV 25301-1425

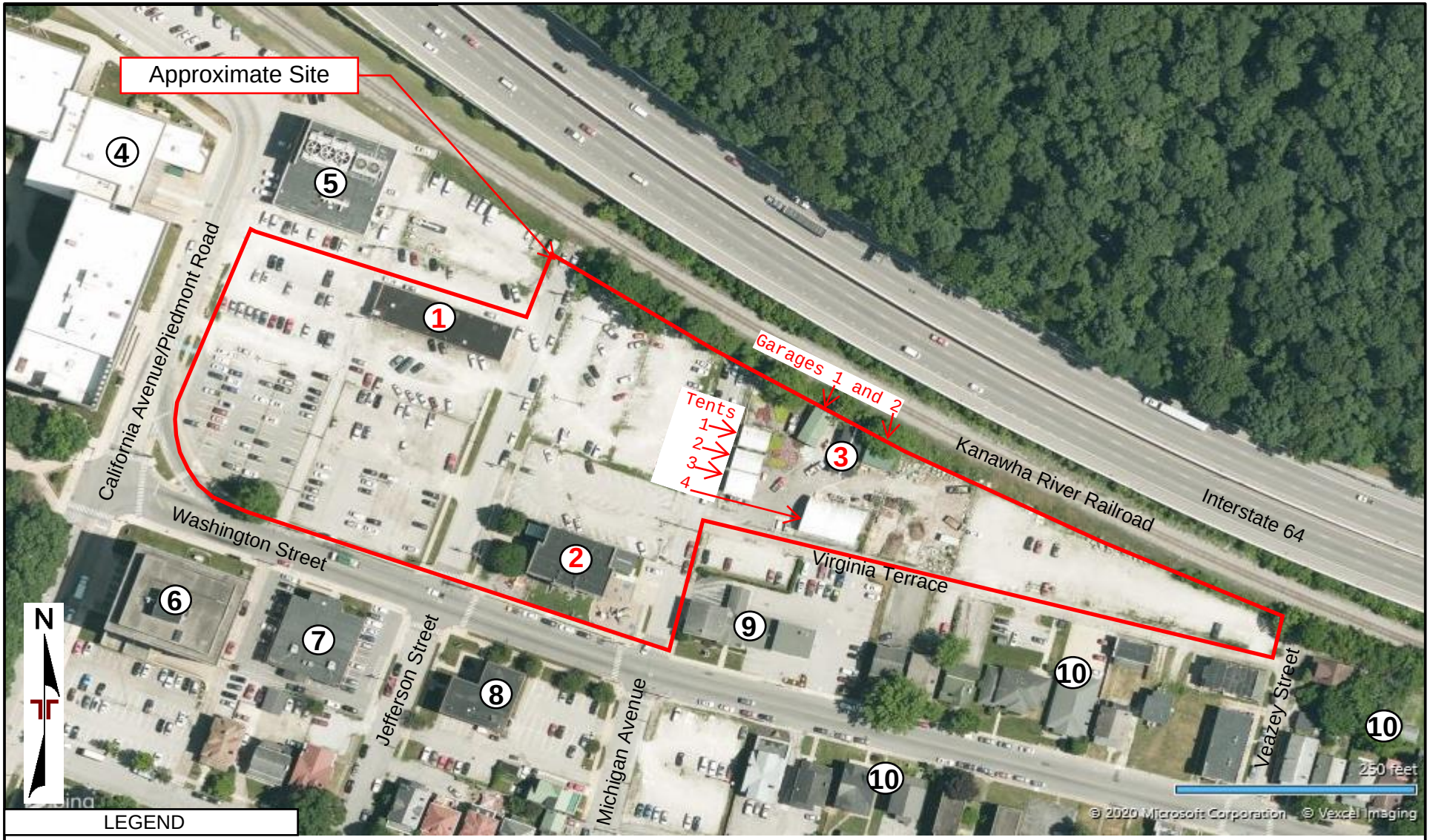
TOPOGRAPHIC MAP

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and
2100 Washington Street East, Charleston, WV

Exhibit

1



LEGEND

1: Mailroom (311 Jefferson Street) **2**: West Virginia Early Learning Academy (2100 Washington Street) **3**: Groundskeeping Office (312 Michigan Avenue)
4: West Virginia Division of Highways (1900 Kanawha Boulevard) **5**: Capitol Chiller Plant (218 California Avenue) **6**: WV Bureau of Employment (112 California Avenue)
7: Capitol Purchasing (2019 Washington Avenue East)
8: Capitol Financing (2019 Washington Street East)
9: State Credit Union (2200 Washington Street East)
10: Residential/Apartments

Project Manager:	LJS
Drawn by:	LJS
Checked by:	JBS
Approved by:	JBS

Project No.	N2207015
Scale:	AS SHOWN
File Name:	Exhibits
Date:	6/9/2020

Terracon
912 Morris St
Charleston, WV 25301-1425

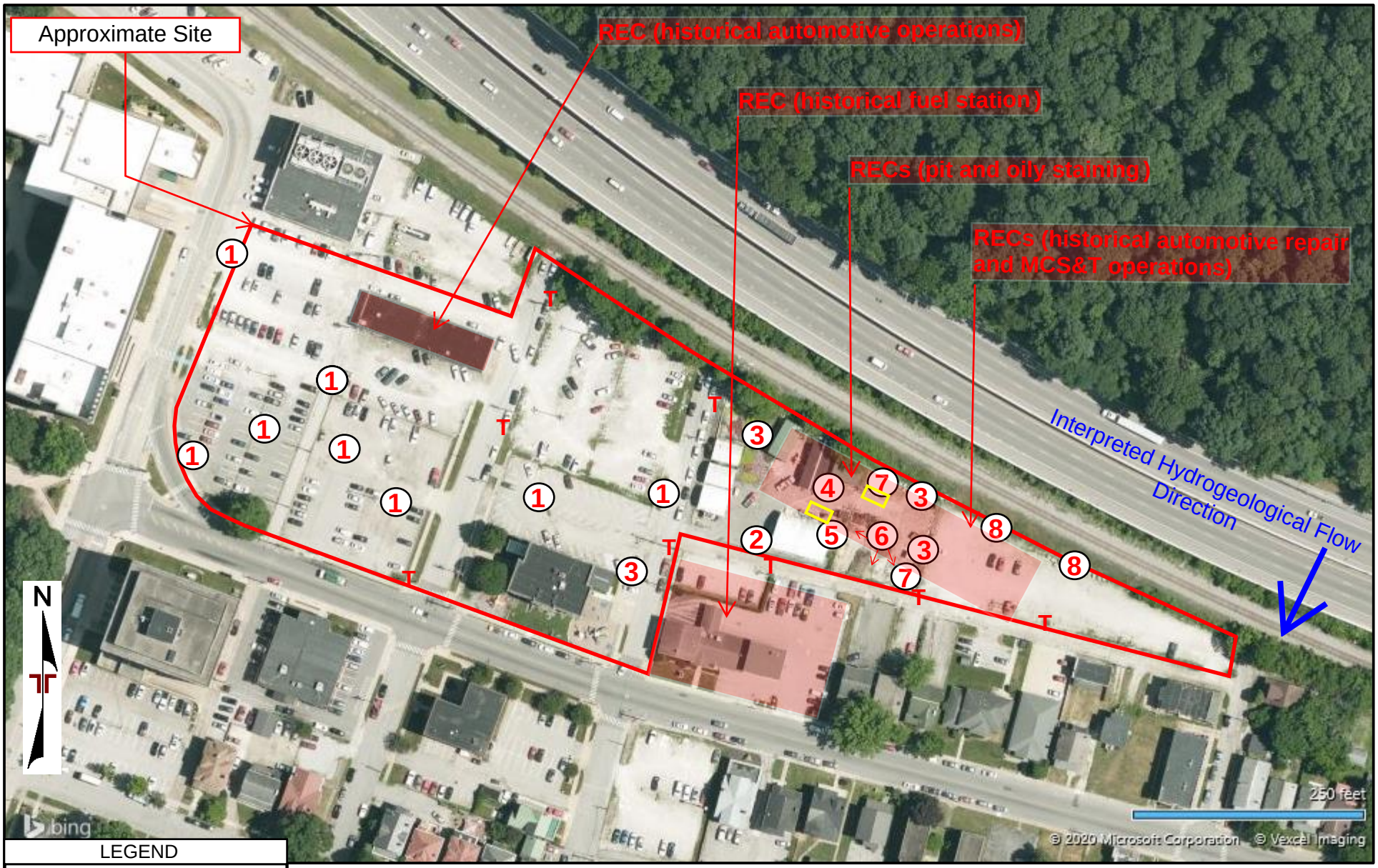
SITE AREA MAP

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and
2100 Washington Street East, Charleston, WV

Exhibit

2



LEGEND

- 1: Stormwater Drain
- 2: ASTs
- 3: Dumpster
- 4: 55-gallon Drum
- 5: Inactive Well
- 6: Stockpiled Organics
- 7: Debris
- 8: Building Materials
- T: Transformer
- Historical UST Basin

Project Manager:	LJS
Drawn by:	LJS
Checked by:	JBS
Approved by:	JBS

Project No.	N2207015
Scale:	AS SHOWN
File Name:	Exhibits
Date:	6/9/2020

Terracon
912 Morris St
Charleston, WV 25301-1425

SITE DIAGRAM

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and
2100 Washington Street East, Charleston, WV

Exhibit 3

APPENDIX B

SITE PHOTOGRAPHS

Project Name: Proposed Capitol East Campus Redevelopment
Terracon Project No. N2207015
Date Photos Taken: May 28, 2020



Photo #1 Looking east from the northwestern corner of the site.



Photo #2 View of north-adjoining Chiller Plant.



Photo #3 Representative view of the west from the border of the site.



Photo #4 Looking north from the southwestern corner of the site.



Photo #5 Looking east from the southwestern corner of the site.



Photo #6 View of the south from the southwestern border of the site.

Project Name: Proposed Capitol East Campus Redevelopment
Terracon Project No. N2207015
Date Photos Taken: May 28, 2020



Photo #7 View of the south from the southeastern border of the site.



Photo #8 Looking south along Michigan Avenue from the central portion of the site.



Photo #9 Looking east along Virginia Terrace from the central portion of the site.



Photo #10 View of the east from the eastern border of the site.



Photo #11 Looking west from the eastern border of the site.



Photo #12 Representative view of the north from the site border.



Photo #13 Looking south along Jefferson Street from northern portion of the site.



Photo #14 View inside Tent 4.



Photo #15 View inside Tent 4



Photo #16 View inside Tent 4.



Photo #17 View of used-oil drum by Groundskeeping Office.



Photo #18 View of debris and groundskeeping yard storage materials



Photo #19 View of stockpiled organics and gravel.



Photo #20 View of groundskeeping dumpsters.



Photo #21 View of Garage 1.



Photo #22 View of potted plants in groundskeeping yard.



Photo #23 Propane tanks in groundskeeping yard.



Photo #24 View in Tent 2 (stormwater drain).



Photo #25 View of Tents 1-3.



Photo #26 Transformers at the northern extent of Jefferson Street.



Photo #27 Representative stormwater drain.



Photo #28 Freezer on the northwestern exterior of the Daycare.



Photo #29 View of building/construction materials in eastern portion of the site.



Photo #30 ASTs in the groundskeeping yard.



Photo #31 View of assumed inactive well.



Photo #32 Representative view of Daycare.



Photo #33 Floor drain inside basement of Daycare.



Photo #34 Air compressor in basement of Daycare.



Photo #35 Burner in basement of Daycare.



Photo #36 Representative Daycare restroom.



Photo #37 Representative Daycare room.



Photo #38 Daycare kitchen hood.

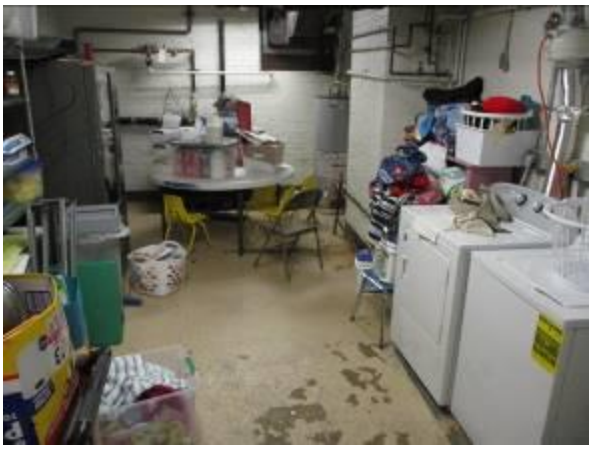


Photo #39 Daycare washer/dryer.



Photo #40 Representative view of Mailroom/carpentry building.



Photo #41 View inside mailroom.



Photo #42 Mailroom restroom.



Photo #43 Carpentry area.



Photo #44 Forced air unit in Mailroom.



Photo #45 View of Groundskeeping Office and Garage 2.



Photo #46 Inside Groundskeeping Office.



Photo #47 Groundskeeping products in office storage.

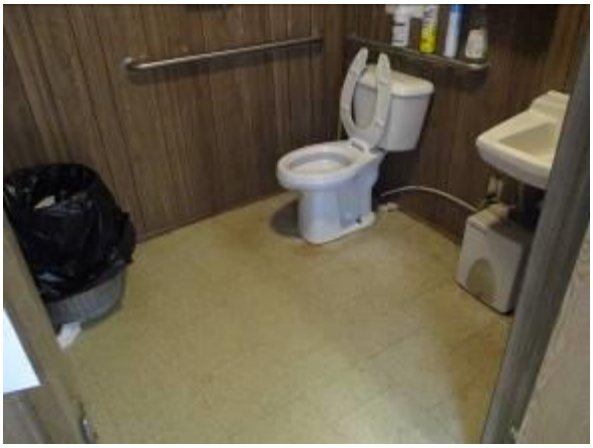


Photo #48 Groundskeeping Office restroom.



Photo #49 Inside maintenance garage (Garage 2).



Photo #50 Inside Garage 2.



Photo #51 Inside Garage 2.



Photo #52 Garage 2 restroom.



Photo #53 Inside Garage 2 restroom.



Photo #54 View of drainage pit in Garage 2.

APPENDIX C

HISTORICAL DOCUMENTATION AND USER QUESTIONNAIRE

N2207015

302 Jefferson Street

Charleston, WV 25311

Inquiry Number: 6073152.8

May 26, 2020

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

05/26/20

Site Name:

N2207015
302 Jefferson Street
Charleston, WV 25311
EDR Inquiry # 6073152.8

Client Name:

Terracon
912 Morris Street
Charleston, WV 25301
Contact: Levi Sheff

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2016	1"=500'	Flight Year: 2016	USDA/NAIP
2011	1"=500'	Flight Year: 2011	USDA/NAIP
2007	1"=500'	Flight Year: 2007	USDA/NAIP
1996	1"=500'	Flight Date: April 11, 1996	USGS
1990	1"=500'	Acquisition Date: October 05, 1990	USGS/DOQQ
1986	1"=500'	Flight Date: March 24, 1986	USDA
1977	1"=500'	Flight Date: April 09, 1977	USGS
1971	1"=500'	Flight Date: April 12, 1971	USGS
1960	1"=500'	Flight Date: April 13, 1960	USGS
1955	1"=500'	Flight Date: April 08, 1955	USGS

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0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	2016 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 2016		



0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	2011 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311	Appendix C
Drawn By: EDR	Scale: As Shown			
Checked By: LJS	File Name: Aerials			
Approved By: JBS	Date: 2011			



0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	2007 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 2007		



0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1996 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 1996		



0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1990 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 1990		



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Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1986 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 1986		



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Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1977 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 1977		



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Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1971 AERIAL PHOTOGRAPH	Appendix
Drawn By: EDR	Scale: As Shown		N2207015 302 Jefferson Street Charleston, WV 25311	C
Checked By: LJS	File Name: Aerials			
Approved By: JBS	Date: 1971			



0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1960 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311	Appendix C
Drawn By: EDR	Scale: As Shown			
Checked By: LJS	File Name: Aerials			
Approved By: JBS	Date: 1960			



0 Feet 500 1000 2000

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1955 AERIAL PHOTOGRAPH N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: EDR	Scale: As Shown		Appendix C
Checked By: LJS	File Name: Aerials		
Approved By: JBS	Date: 1955		

N2207015

302 Jefferson Street

Charleston, WV 25311

Inquiry Number: 6073152.4

May 26, 2020

EDR Historical Topo Map Report

with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

05/26/20

Site Name:

N2207015
302 Jefferson Street
Charleston, WV 25311
EDR Inquiry # 6073152.4

Client Name:

Terracon
912 Morris Street
Charleston, WV 25301
Contact: Levi Sheff

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by Terracon were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

Search Results:

P.O.# NA
Project: N2207015

Coordinates:

Latitude:	38.337069 38° 20' 13" North
Longitude:	-81.6084 -81° 36' 30" West
UTM Zone:	Zone 17 North
UTM X Meters:	446829.29
UTM Y Meters:	4243389.71
Elevation:	599.00' above sea level

Maps Provided:

2014
1996
1976
1971
1957, 1958
1952
1935
1931
1909
1899

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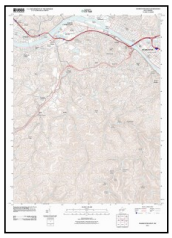
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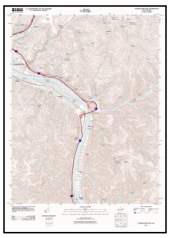
Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

2014 Source Sheets



Charleston West
2014
7.5-minute, 24000



Charleston East
2014
7.5-minute, 24000

1996 Source Sheets



Charleston East
1996
7.5-minute, 24000
Aerial Photo Revised 1996



Charleston West
1996
7.5-minute, 24000
Aerial Photo Revised 1996

1976 Source Sheets



Charleston East
1976
7.5-minute, 24000
Aerial Photo Revised 1976



Charleston West
1976
7.5-minute, 24000
Aerial Photo Revised 1976

1971 Source Sheets



Charleston East
1971
7.5-minute, 24000
Aerial Photo Revised 1971



Charleston West
1971
7.5-minute, 24000
Aerial Photo Revised 1971

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1957, 1958 Source Sheets



Charleston East
1957
7.5-minute, 24000
Aerial Photo Revised 1955



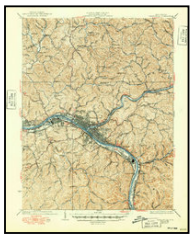
Charleston West
1958
7.5-minute, 24000
Aerial Photo Revised 1958

1952 Source Sheets



Charleston
1952
15-minute, 62500
Aerial Photo Revised 1952

1935 Source Sheets



Charleston
1935
15-minute, 62500

1931 Source Sheets



Charleston
1931
15-minute, 62500

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1909 Source Sheets

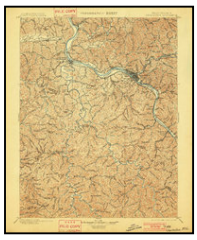


Charleston
1909
15-minute, 62500

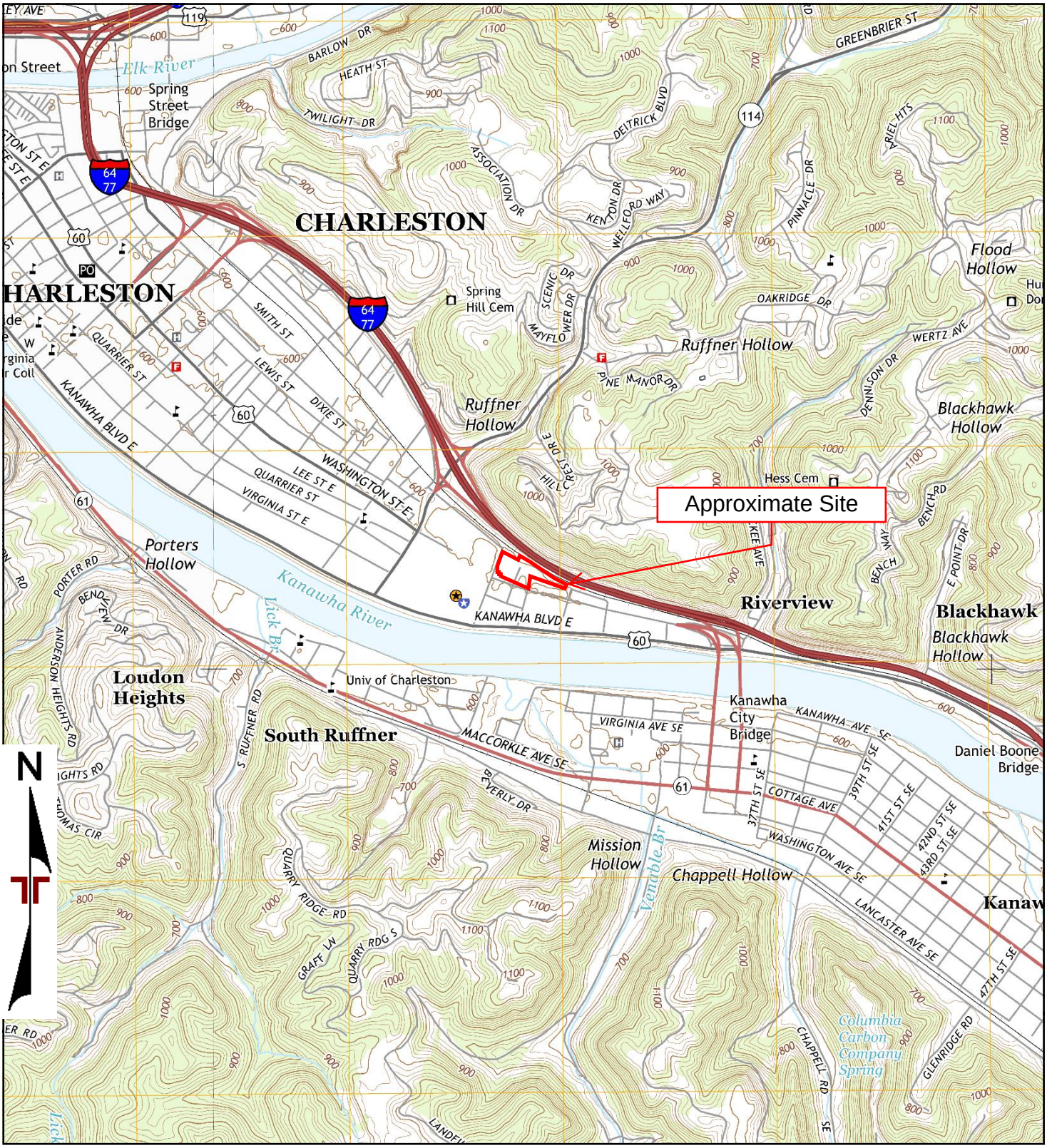


Charleston Special
1909
15-minute, 62500

1899 Source Sheets



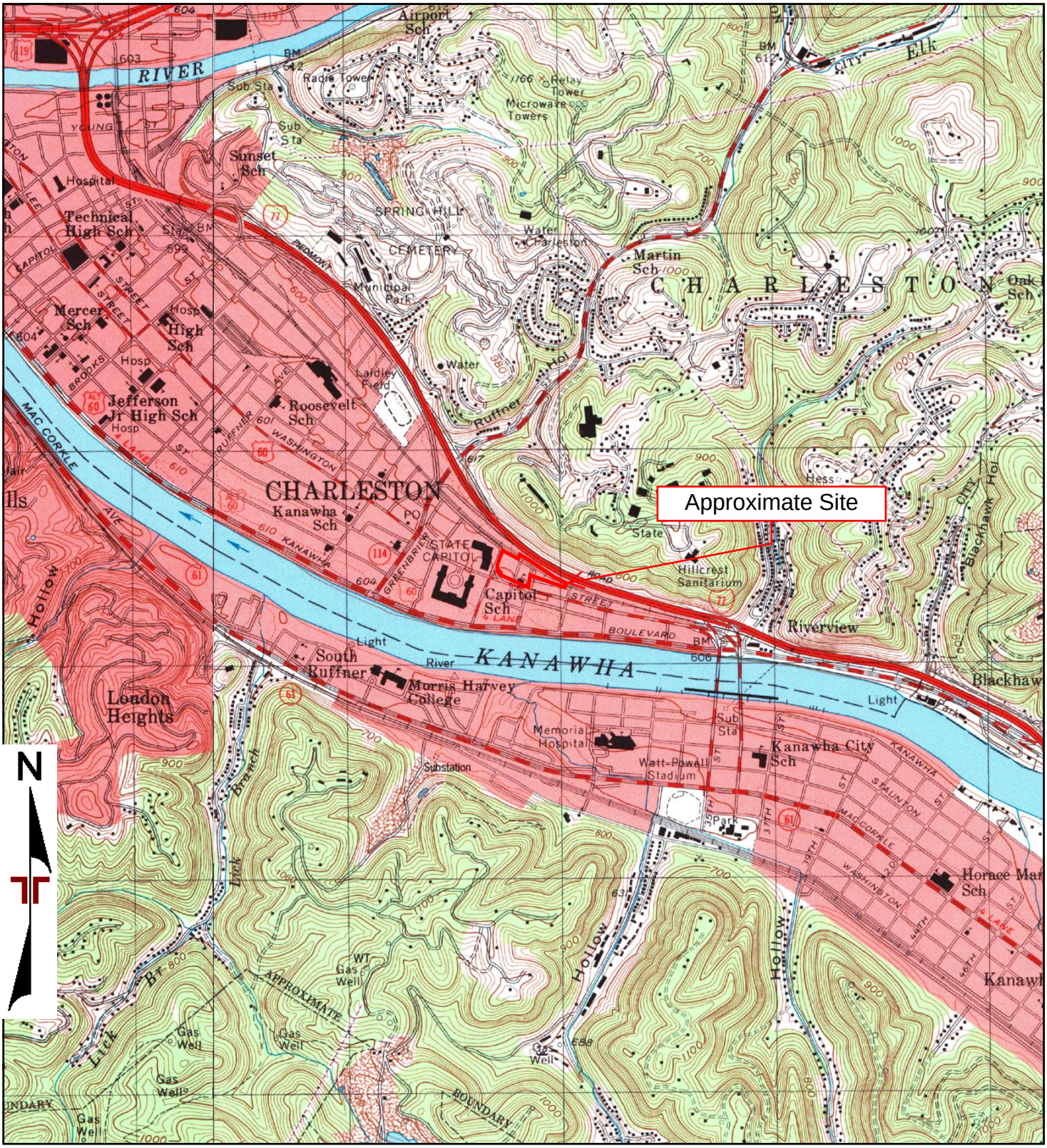
Charleston
1899
30-minute, 125000



TP, Charleston East, 2014, 7.5-minute
W, Charleston West, 2014, 7.5-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: LJS	Project No. N2207015	Terracon 912 Morris Street Charleston, WV 25301	2014 TOPOGRAPHIC MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn by: EDR	Scale: As Shown		Appendix C
Checked by: LJS	File Name: Topos		
Approved by: JBS	Date: 2014		



TP, Charleston East, 1996, 7.5-minute
W, Charleston West, 1996, 7.5-minute

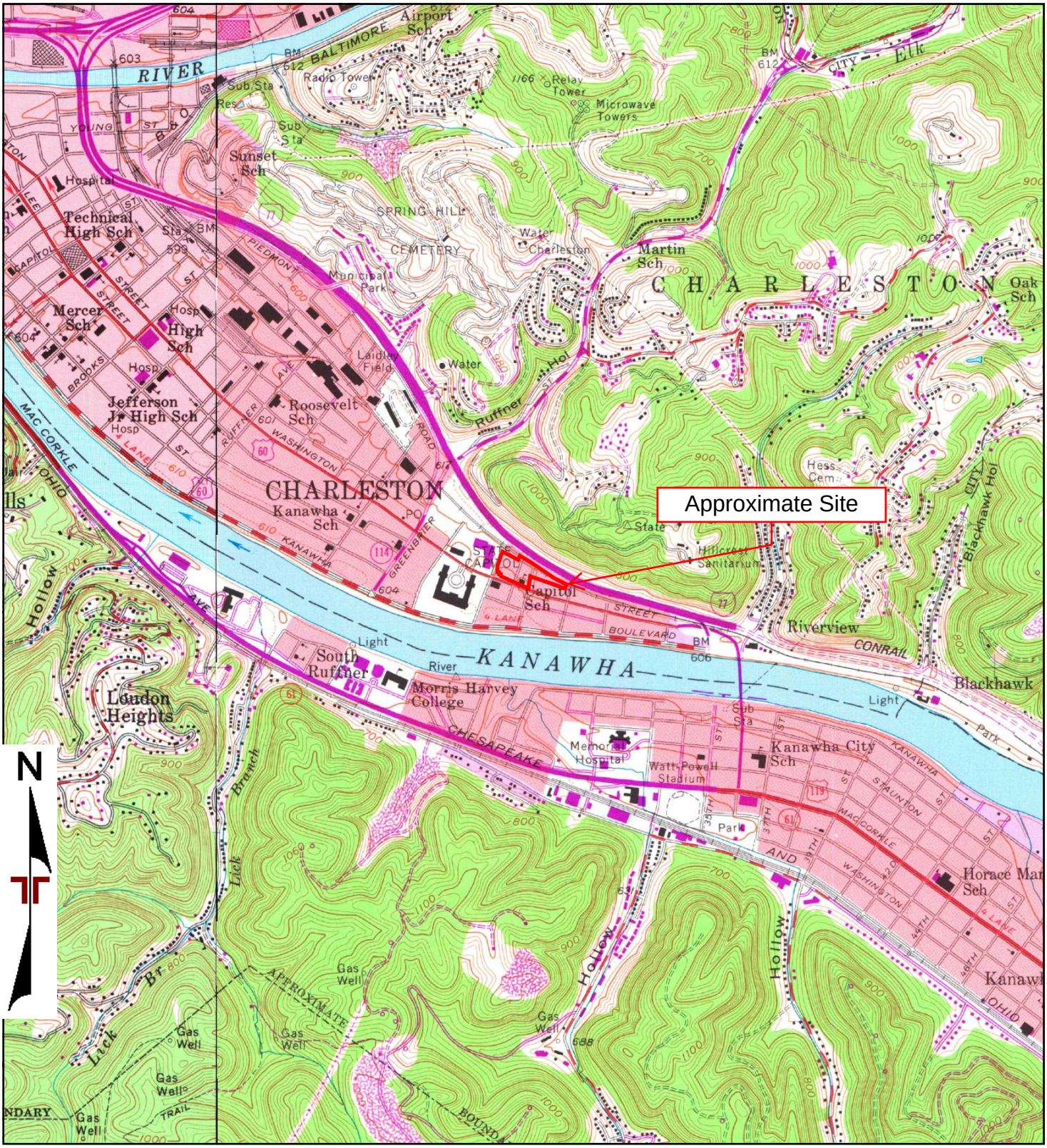
0 Miles 0.25 0.5 1 1.5

Project Manager: LJS	Project No. N2207015
Drawn by: EDR	Scale: As Shown
Checked by: LJS	File Name: Topos
Approved by: JBS	Date: 1996

Terracon
912 Morris Street
Charleston, WV 25301

1996 TOPOGRAPHIC MAP
N2207015
302 Jefferson Street
Charleston, WV 25311

Appendix
C



N

TP, Charleston East, 1976, 7.5-minute
W, Charleston West, 1976, 7.5-minute

0 Miles 0.25 0.5 1 1.5

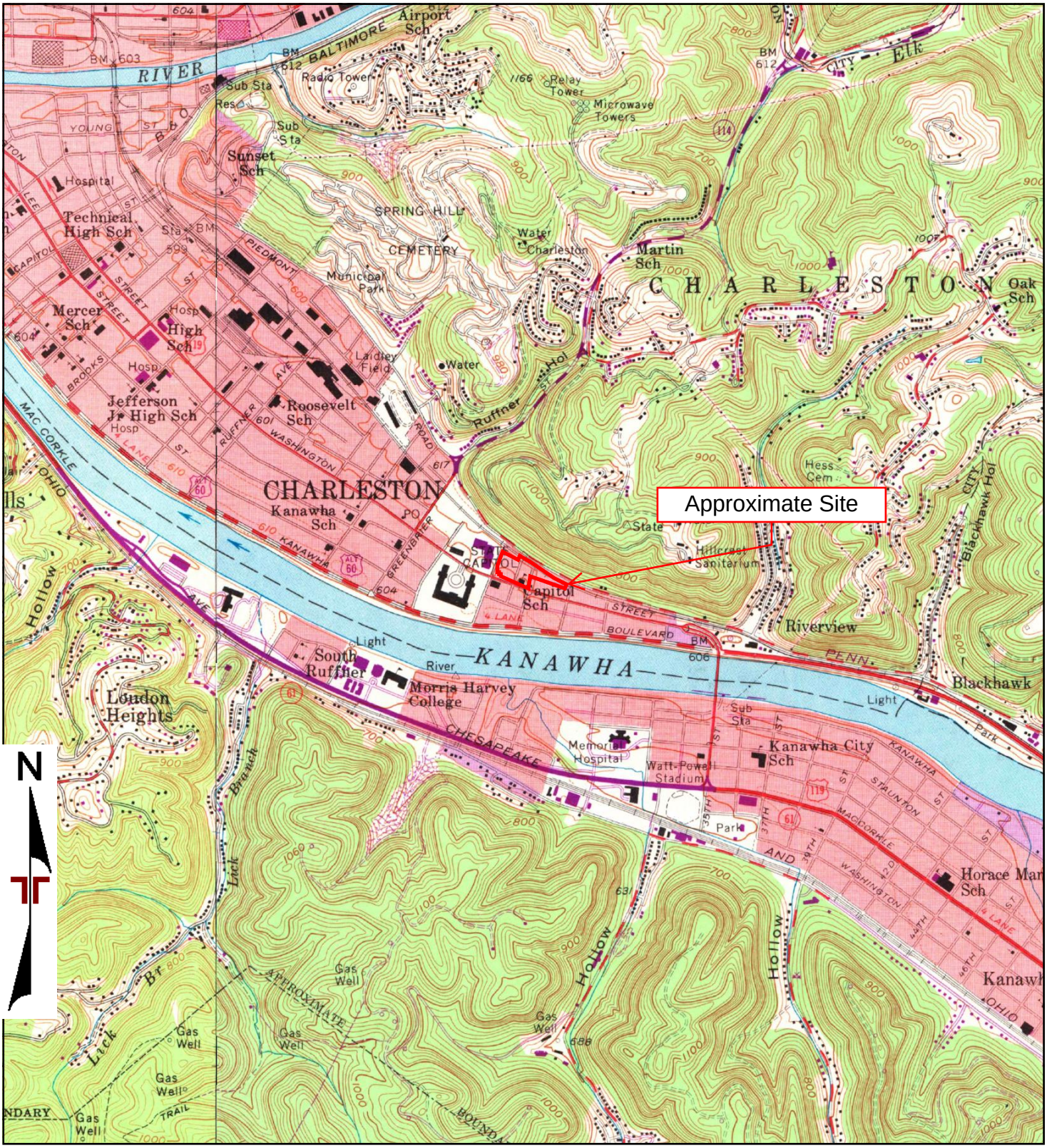
Project Manager:	LJS
Drawn by:	EDR
Checked by:	LJS
Approved by:	JBS

Project No.	N2207015
Scale:	As Shown
File Name:	Topos
Date:	1976

Terracon
912 Morris Street
Charleston, WV 25301

1976 TOPOGRAPHIC MAP
N2207015
302 Jefferson Street
Charleston, WV 25311

Appendix
C



TP, Charleston East, 1971, 7.5-minute
W, Charleston West, 1971, 7.5-minute

0 Miles 0.25 0.5 1 1.5

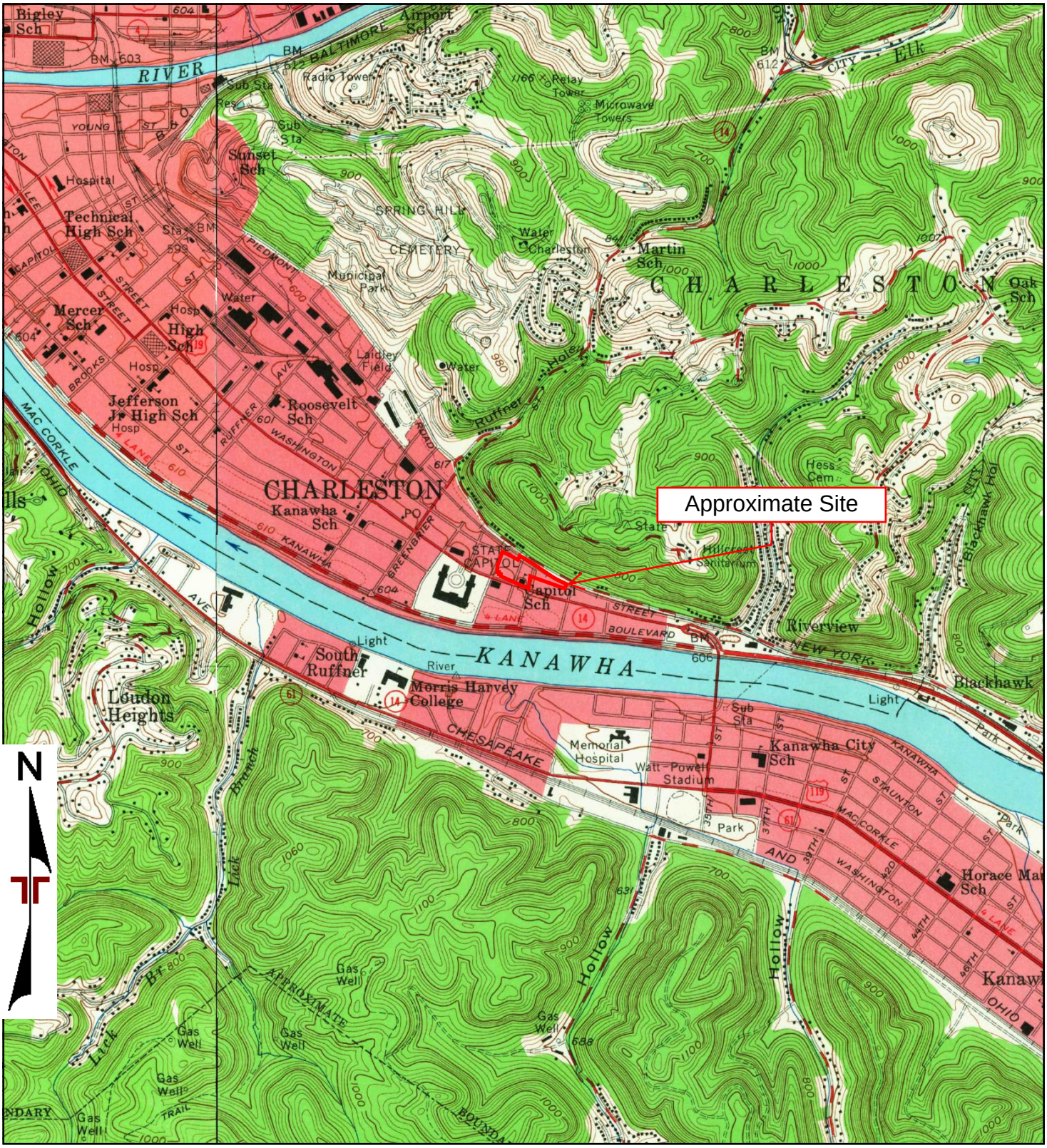
Project Manager:	LJS
Drawn by:	EDR
Checked by:	LJS
Approved by:	JBS

Project No.	N2207015
Scale:	As Shown
File Name:	Topos
Date:	1971

Terracon
912 Morris Street
Charleston, WV 25301

1971 TOPOGRAPHIC MAP
N2207015
302 Jefferson Street
Charleston, WV 25311

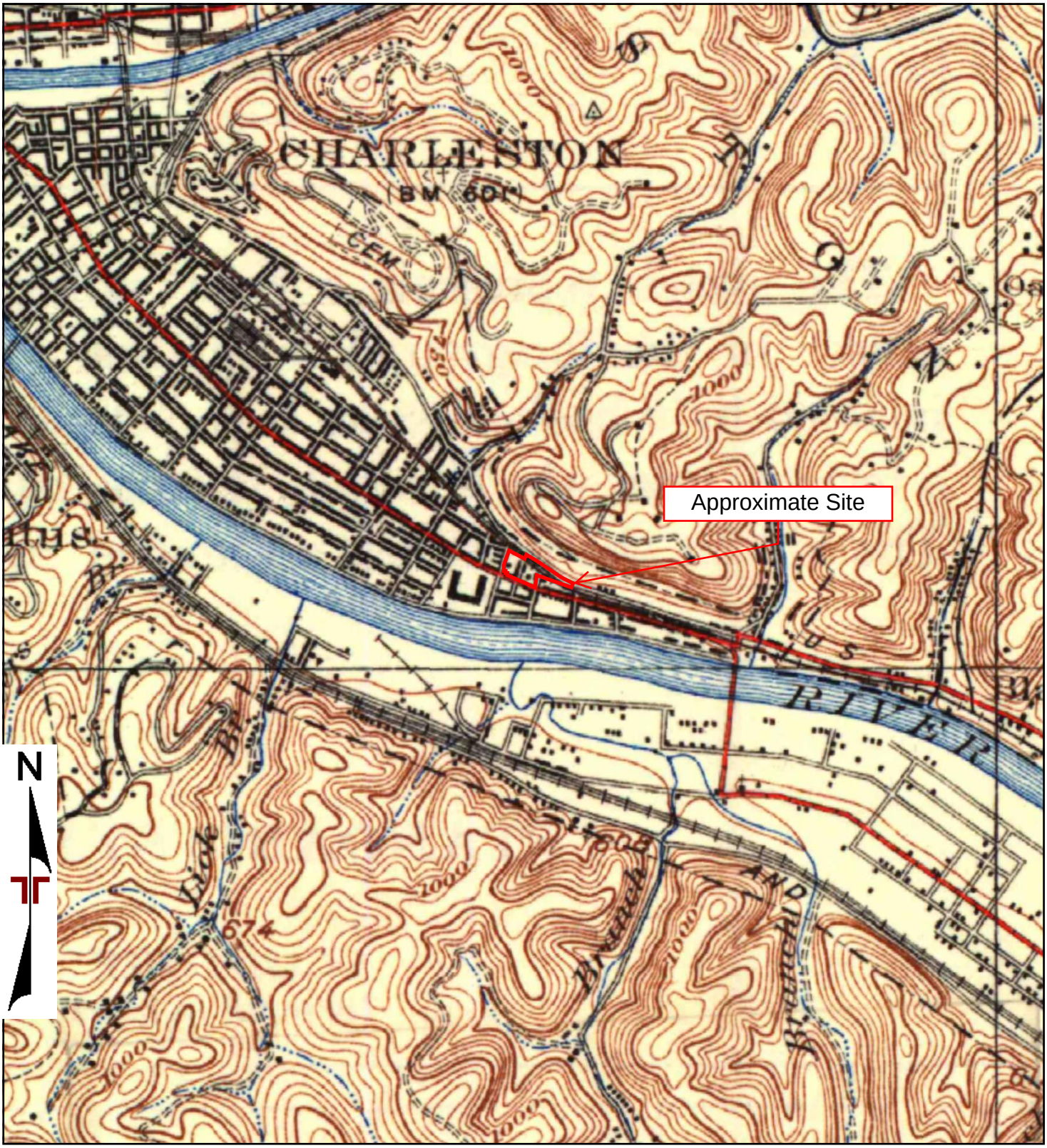
Appendix
C



TP, Charleston East, 1957, 7.5-minute
W, Charleston West, 1958, 7.5-minute

0 Miles 0.25 0.5 1 1.5

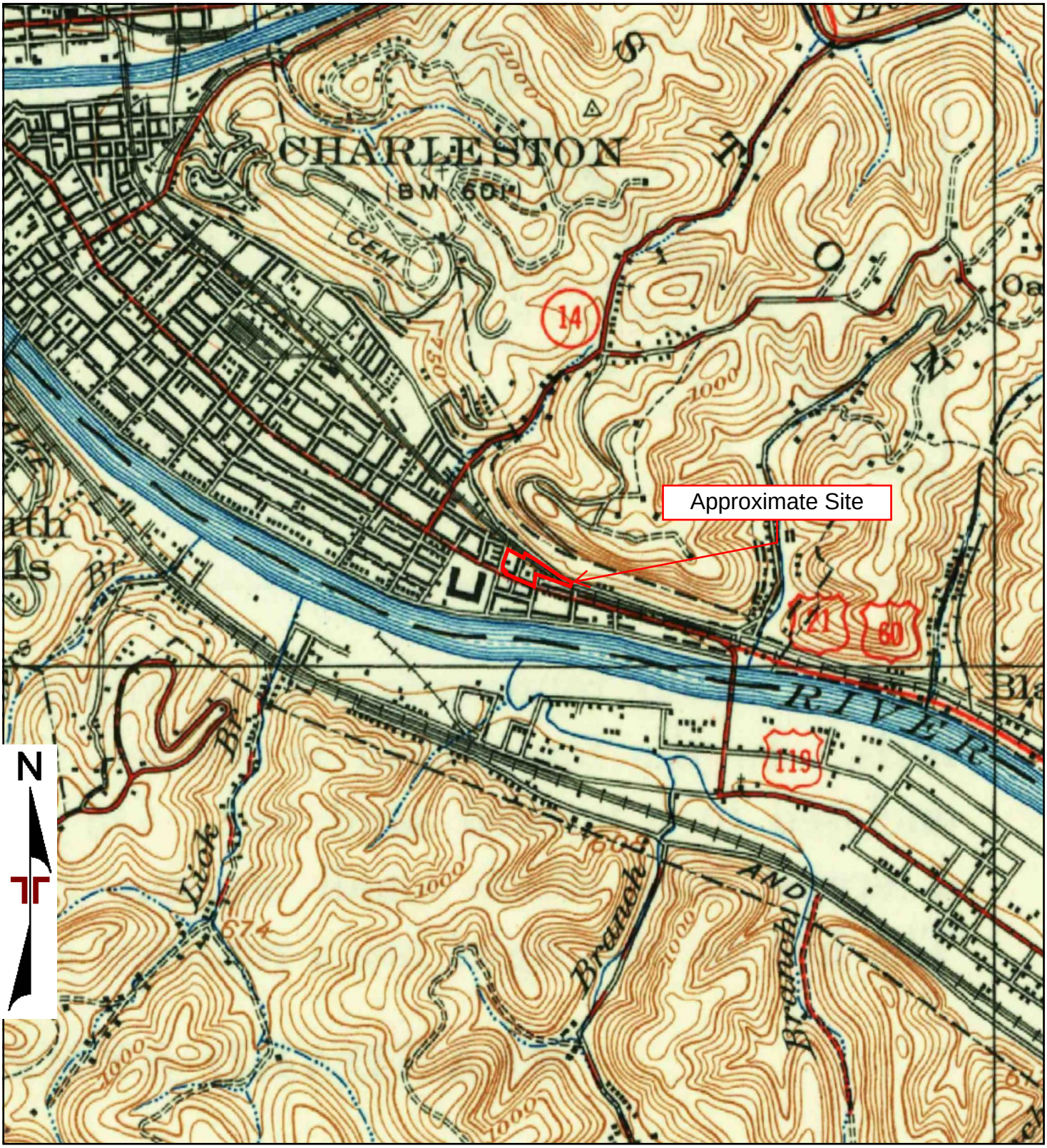
Project Manager: LJS	Project No. N2207015	Terracon 912 Morris Street Charleston, WV 25301	1957, 1958 TOPOGRAPHIC MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn by: EDR	Scale: As Shown		Appendix C
Checked by: LJS	File Name: Topos		
Approved by: JBS	Date: 1957, 1958		



TP, Charleston, 1952, 15-minute

0 Miles 0.25 0.5 1 1.5

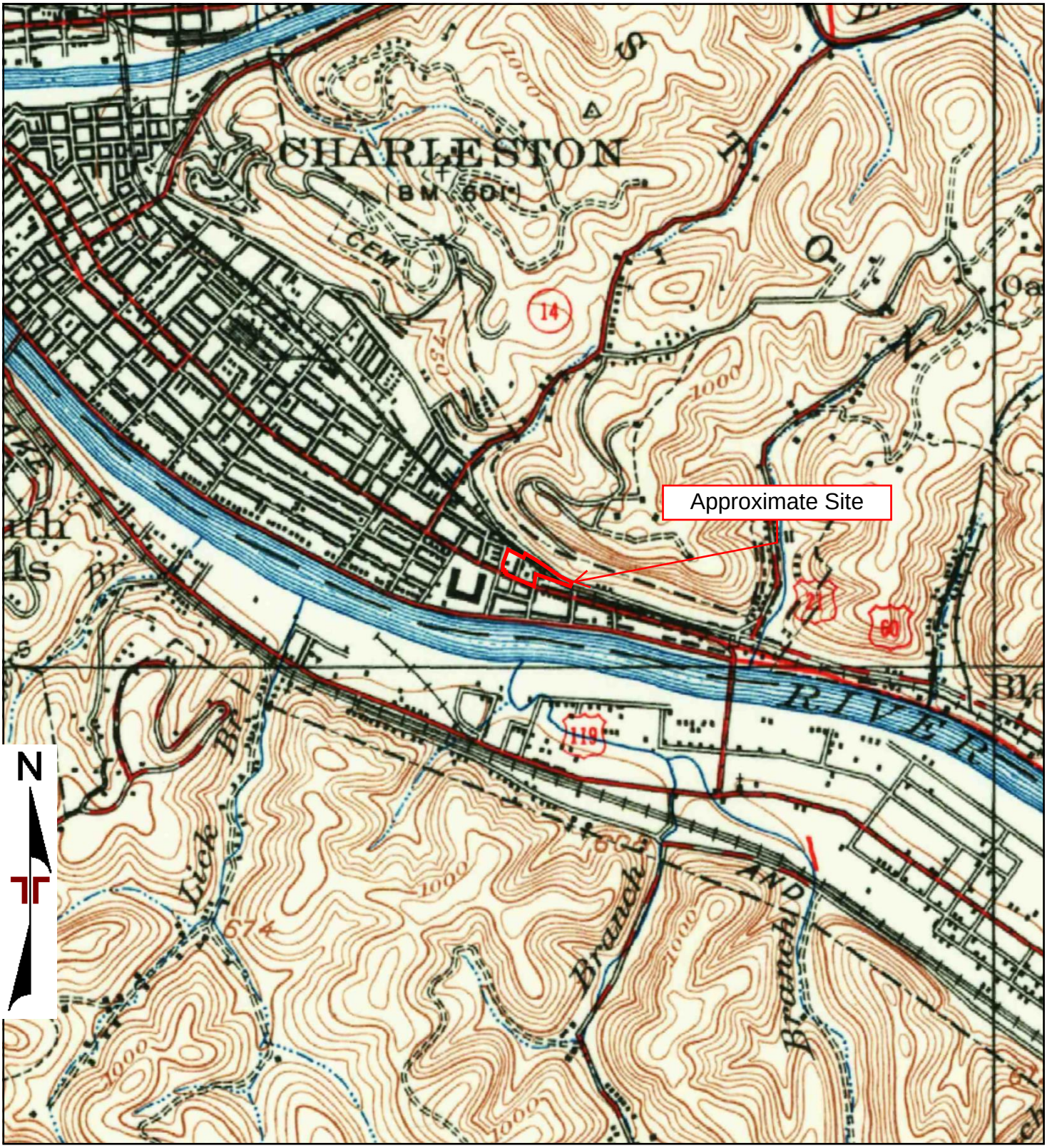
Project Manager: LJS	Project No. N2207015	Terracon 912 Morris Street Charleston, WV 25301	1952 TOPOGRAPHIC MAP N2207015 302 Jefferson Street Charleston, WV 25311	Appendix C
Drawn by: EDR	Scale: As Shown			
Checked by: LJS	File Name: Topos			
Approved by: JBS	Date: 1952			



TP, Charleston, 1935, 15-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: LJS	Project No. N2207015	Terracon 912 Morris Street Charleston, WV 25301	1935 TOPOGRAPHIC MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn by: EDR	Scale: As Shown		
Checked by: LJS	File Name: Topos		
Approved by: JBS	Date: 1935		Appendix C



TP, Charleston, 1931, 15-minute

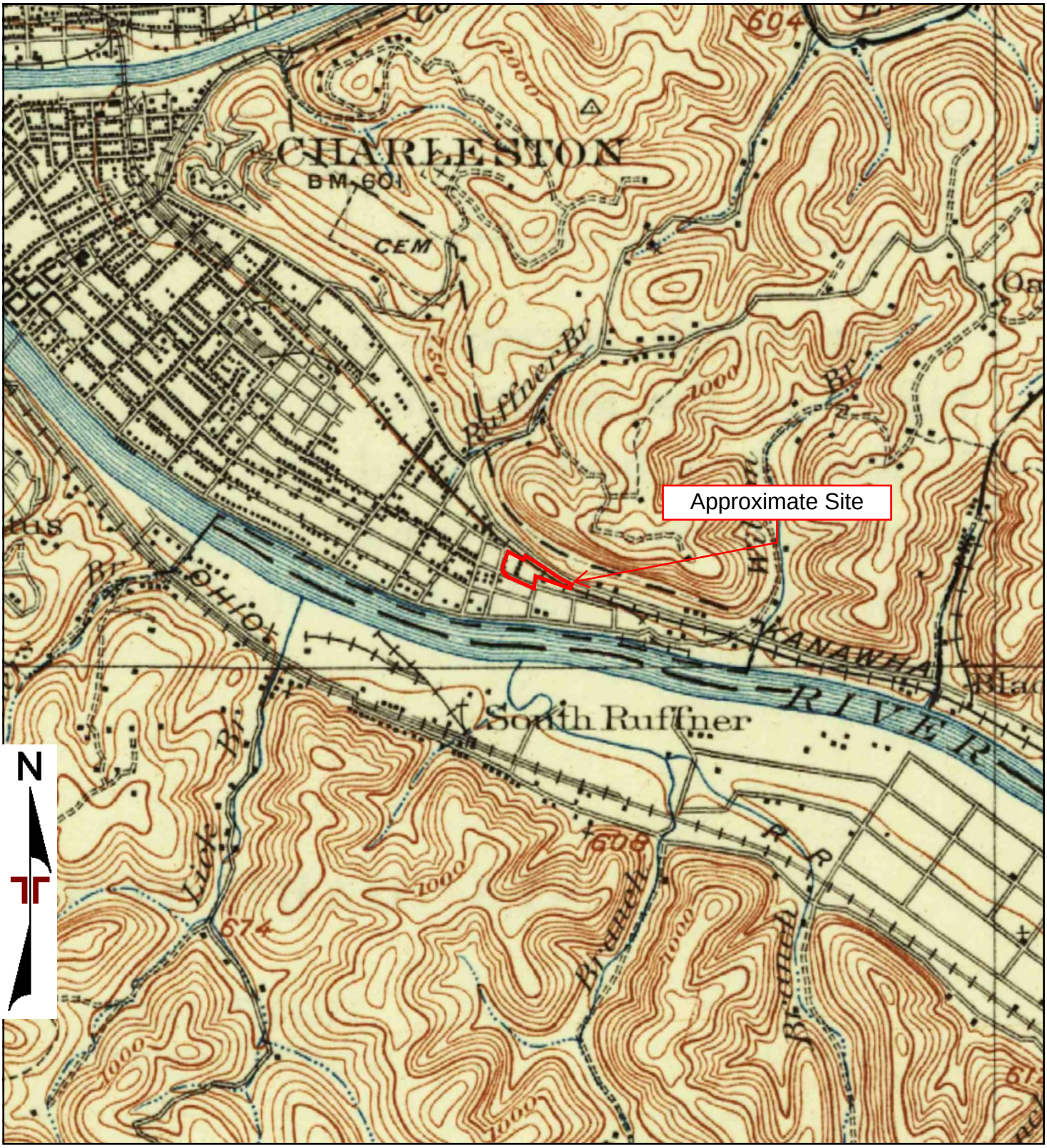
0 Miles 0.25 0.5 1 1.5

Project Manager: LJS	Project No. N2207015
Drawn by: EDR	Scale: As Shown
Checked by: LJS	File Name: Topos
Approved by: JBS	Date: 1931

Terracon
912 Morris Street
Charleston, WV 25301

1931 TOPOGRAPHIC MAP
N2207015
302 Jefferson Street
Charleston, WV 25311

Appendix
C



N

TP, Charleston, 1909, 15-minute
TP, Charleston Special, 1909, 15-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: LJS	Project No. N2207015
Drawn by: EDR	Scale: As Shown
Checked by: LJS	File Name: Topos
Approved by: JBS	Date: 1909

Terracon
912 Morris Street
Charleston, WV 25301

1909 TOPOGRAPHIC MAP
N2207015
302 Jefferson Street
Charleston, WV 25311

Appendix
C



TP, Charleston, 1899, 30-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: LJS	Project No. N2207015	Terracon 912 Morris Street Charleston, WV 25301	1899 TOPOGRAPHIC MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn by: EDR	Scale: As Shown		Appendix C
Checked by: LJS	File Name: Topos		
Approved by: JBS	Date: 1899		

N2207015

302 Jefferson Street

Charleston, WV 25311

Inquiry Number: 6073152.3

May 27, 2020

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05/27/20

Site Name:

N2207015
302 Jefferson Street
Charleston, WV 25311
EDR Inquiry # 6073152.3

Client Name:

Terracon
912 Morris Street
Charleston, WV 25301
Contact: Levi Sheff

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Certification # 2527-46BF-88D8

PO # NA

Project N2207015

Maps Provided:

1989
1972
1950
1933

Sanborn® Library search results

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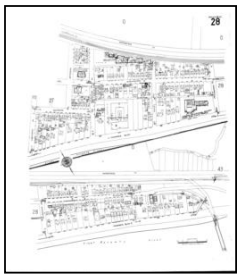
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Sanborn Sheet Key

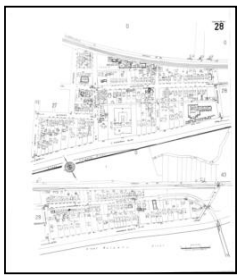
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1989 Source Sheets



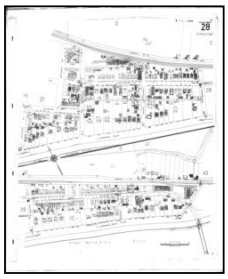
Volume 1, Sheet 28
1989

1972 Source Sheets



Volume 1, Sheet 28
1972

1950 Source Sheets

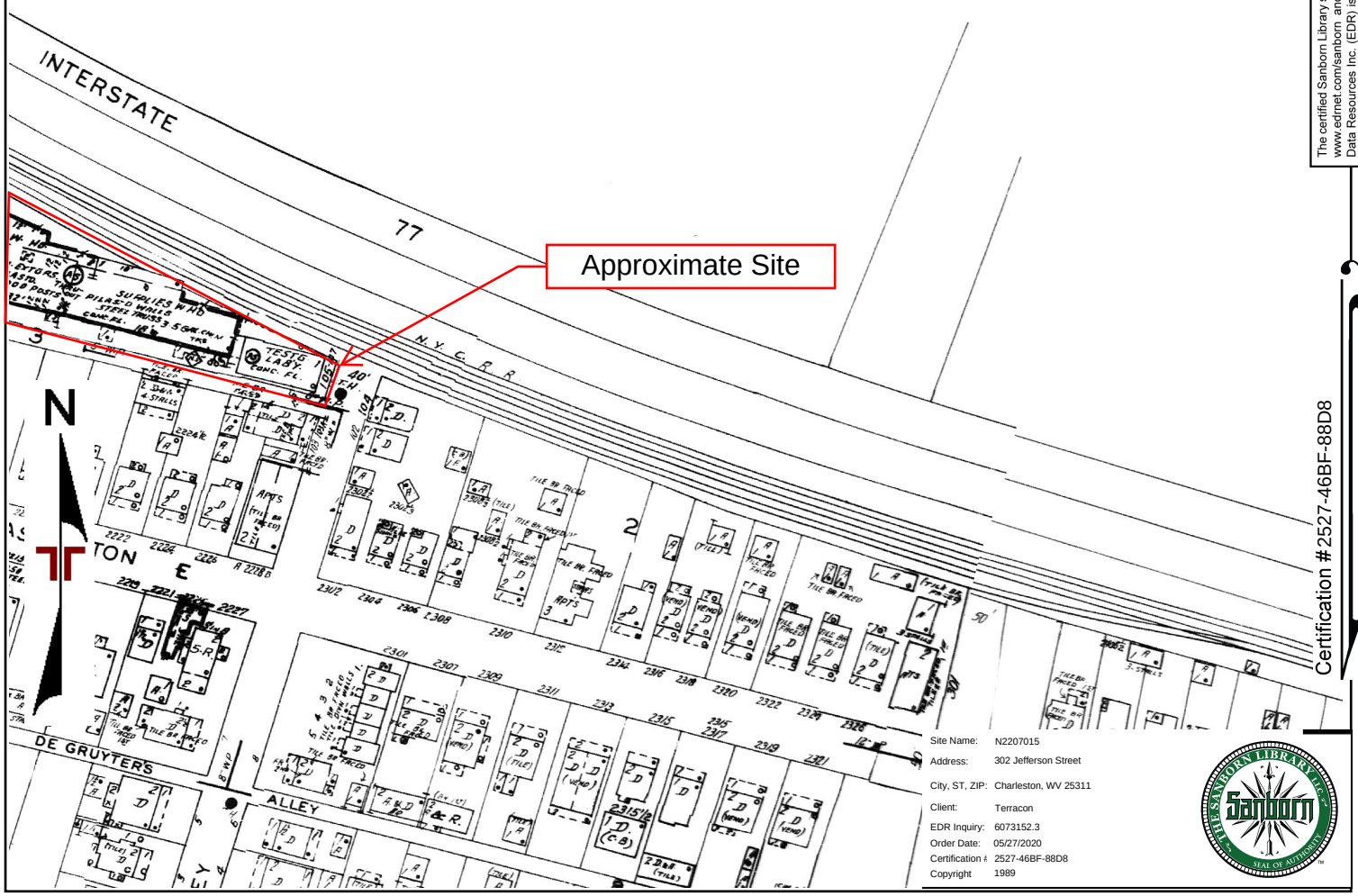


Volume 1, Sheet 28
1950

1933 Source Sheets



Volume 1, Sheet 28
1933



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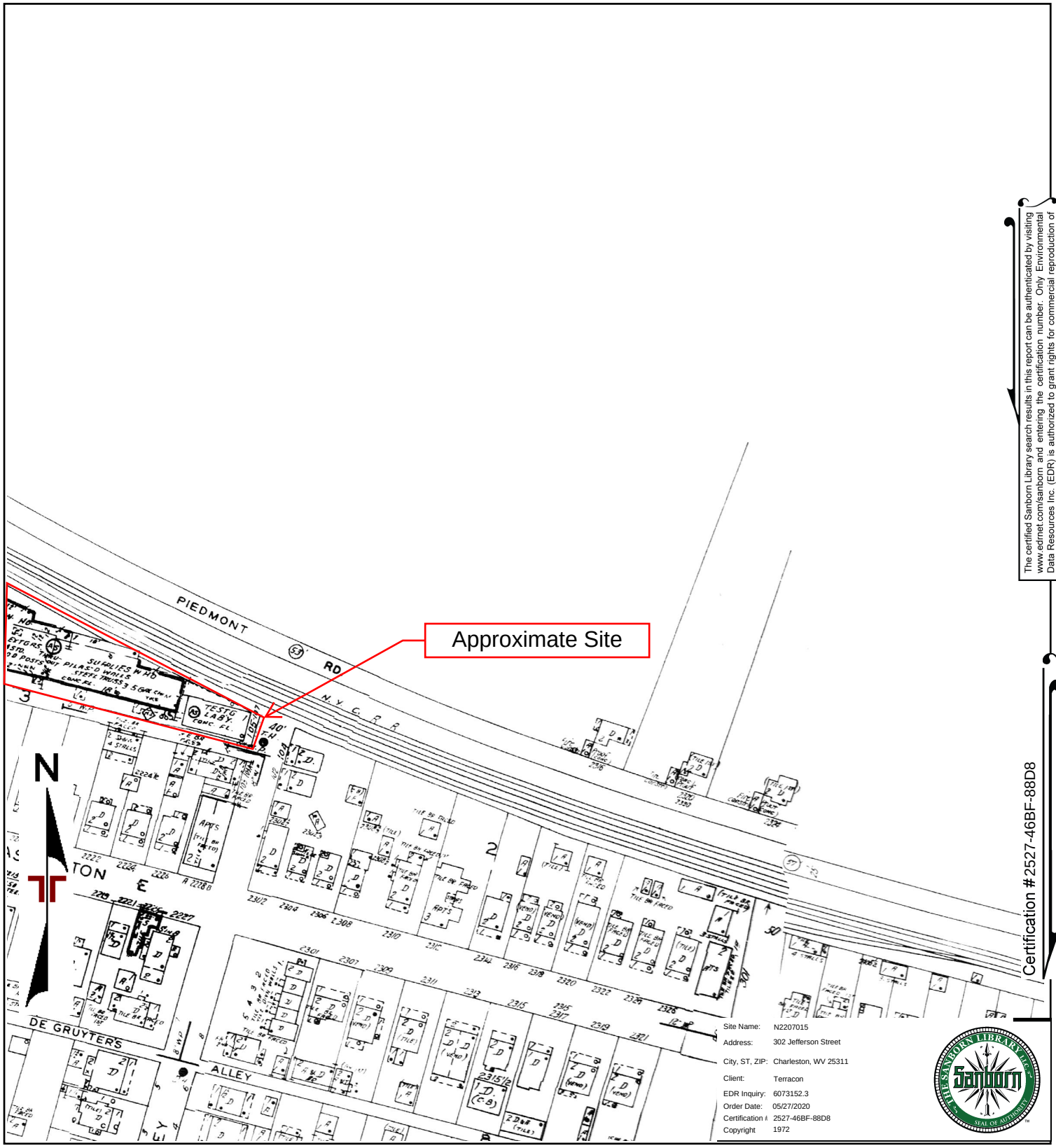
Certification # 2527-46BF-88D8



Volume 1, Sheet 28

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1989 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix: C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1989		



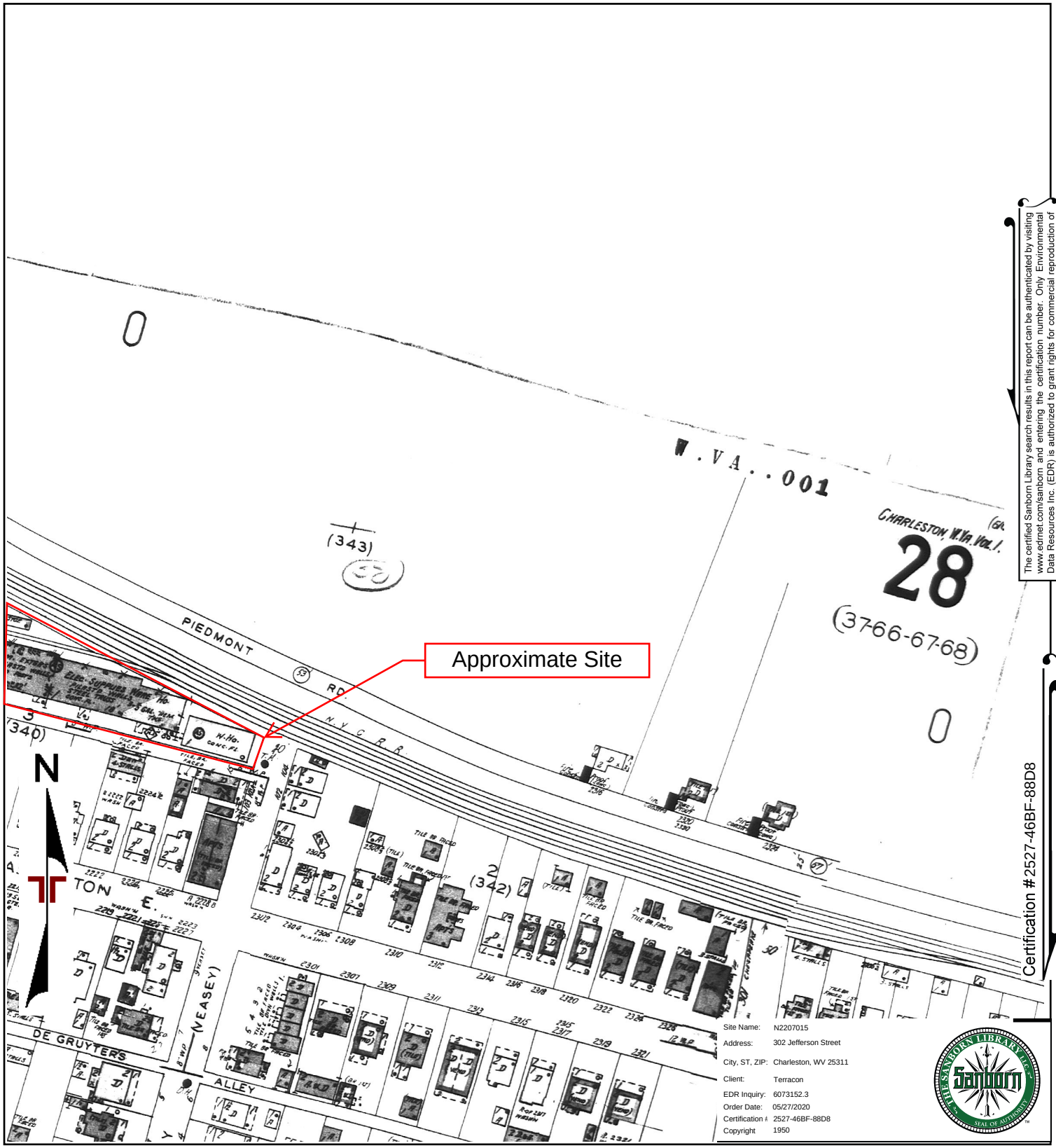
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Volume 1, Sheet 28

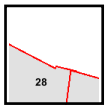
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Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1972 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix: C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1972		



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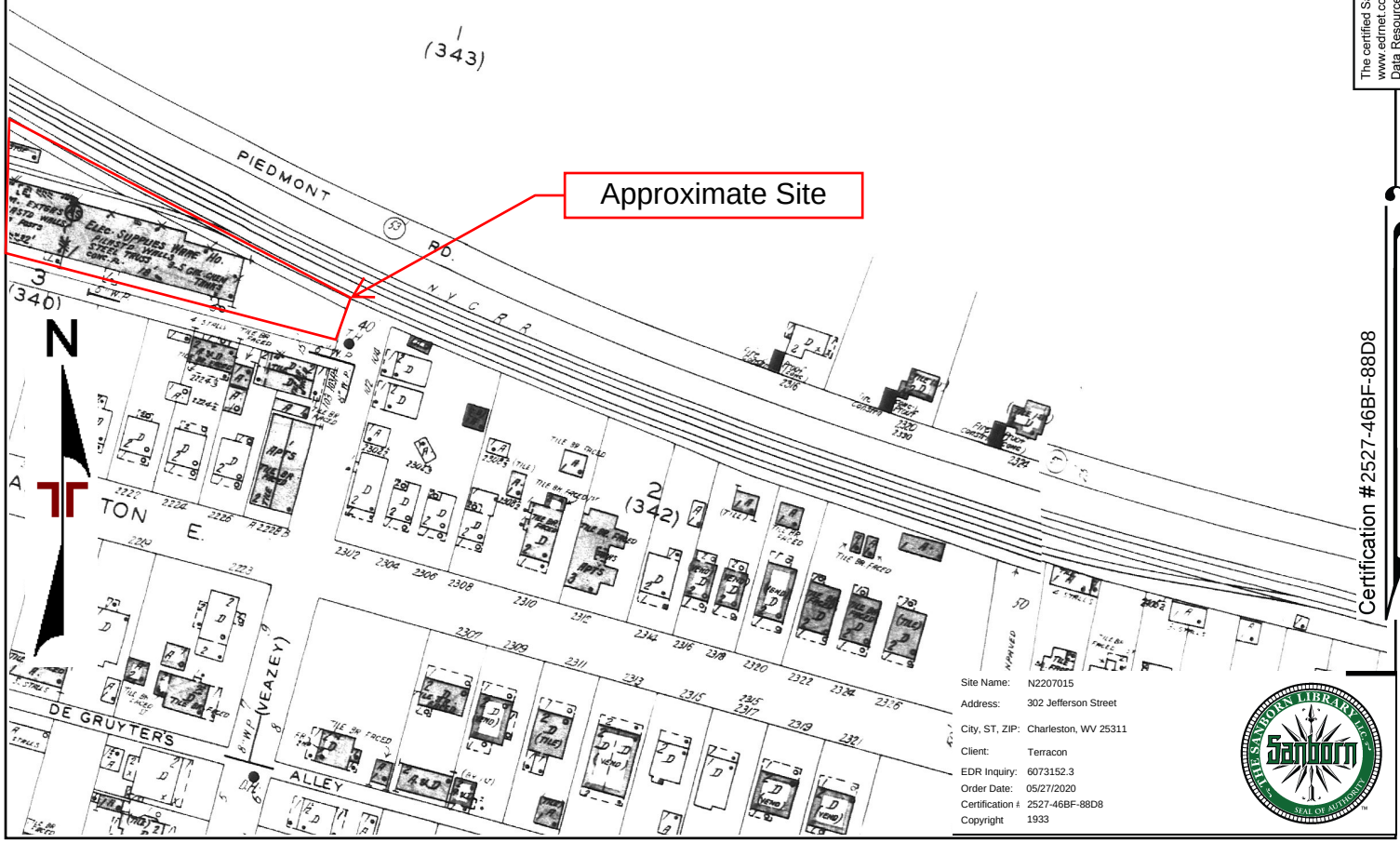


Volume 1, Sheet 28

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1950 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1950		

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Volume 1, Sheet 28

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1933 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311	Appendix C
Drawn By: LJS	Scale: As Shown			
Checked By: JBS	File Name: Sanborns			
Approved By: JBS	Date: 1933			

N2207015

302 Jefferson Street

Charleston, WV 25311

Inquiry Number: 6073152.3

May 27, 2020

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05/27/20

Site Name:

N2207015
302 Jefferson Street
Charleston, WV 25311
EDR Inquiry # 6073152.3

Client Name:

Terracon
912 Morris Street
Charleston, WV 25301
Contact: Levi Sheff

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PO # NA

Project N2207015

Maps Provided:

1989
1972
1950
1933
1912

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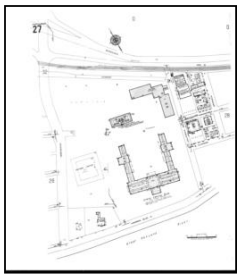
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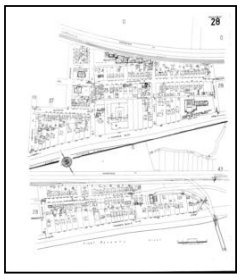
Sanborn Sheet Key

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1989 Source Sheets

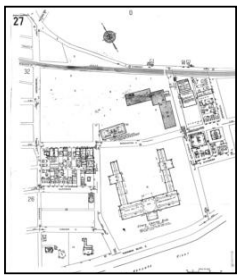


Volume 1, Sheet 27
1989

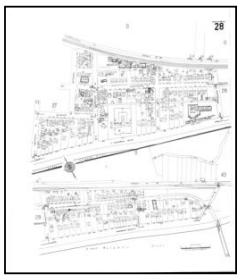


Volume 1, Sheet 28
1989

1972 Source Sheets



Volume 1, Sheet 27
1972

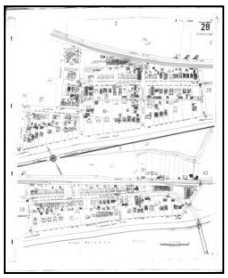


Volume 1, Sheet 28
1972

1950 Source Sheets



Volume 1, Sheet 27
1950



Volume 1, Sheet 28
1950

1933 Source Sheets



Volume 1, Sheet 27
1933

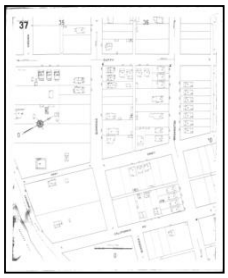


Volume 1, Sheet 28
1933

Sanborn Sheet Key

This Certified Sanborn Map Report is based upon the following Sanborn Fire Insurance map sheets.

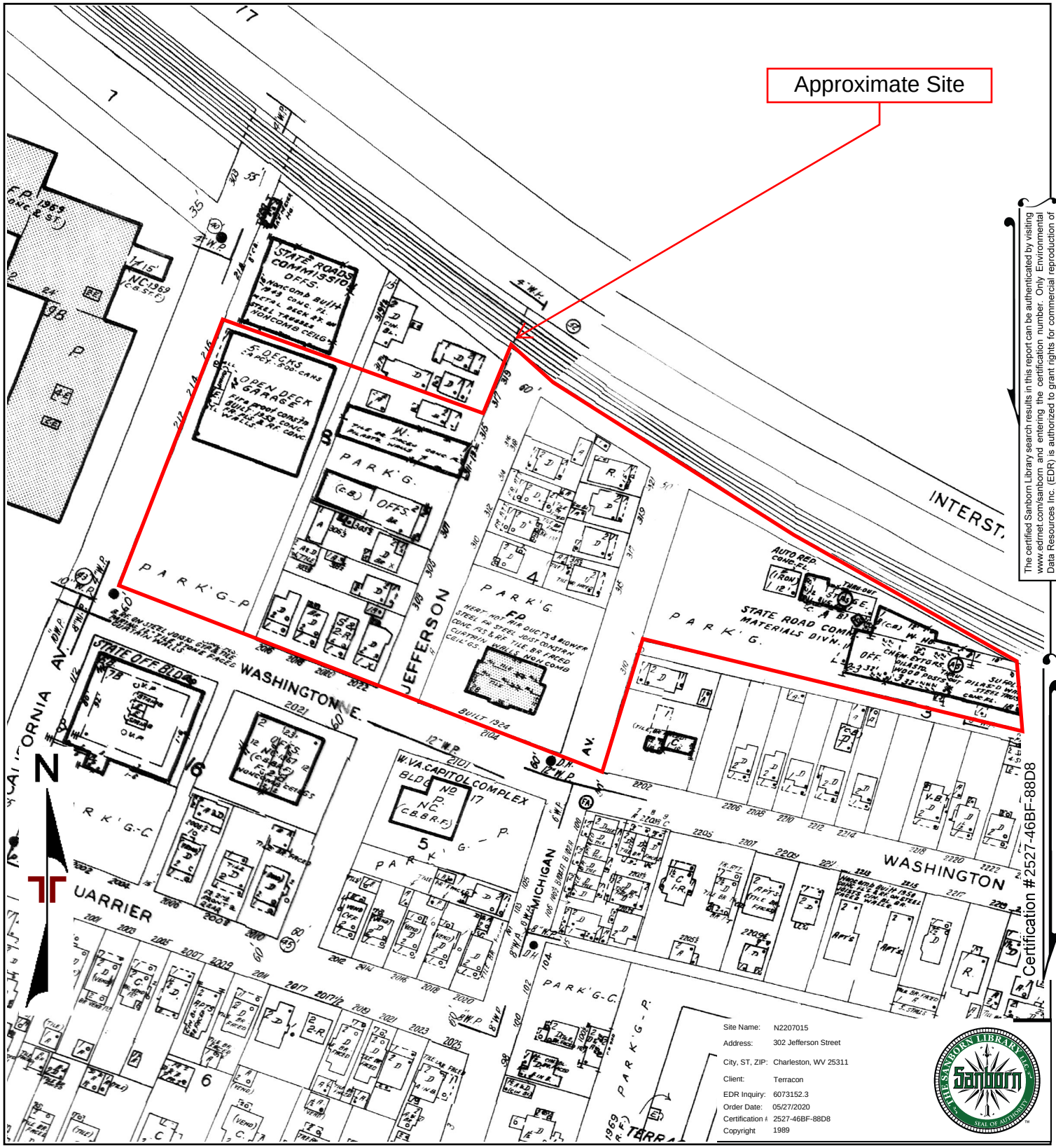
1912 Source Sheets



Volume 1, Sheet 37
1912

Certified Sanborn Map

1989



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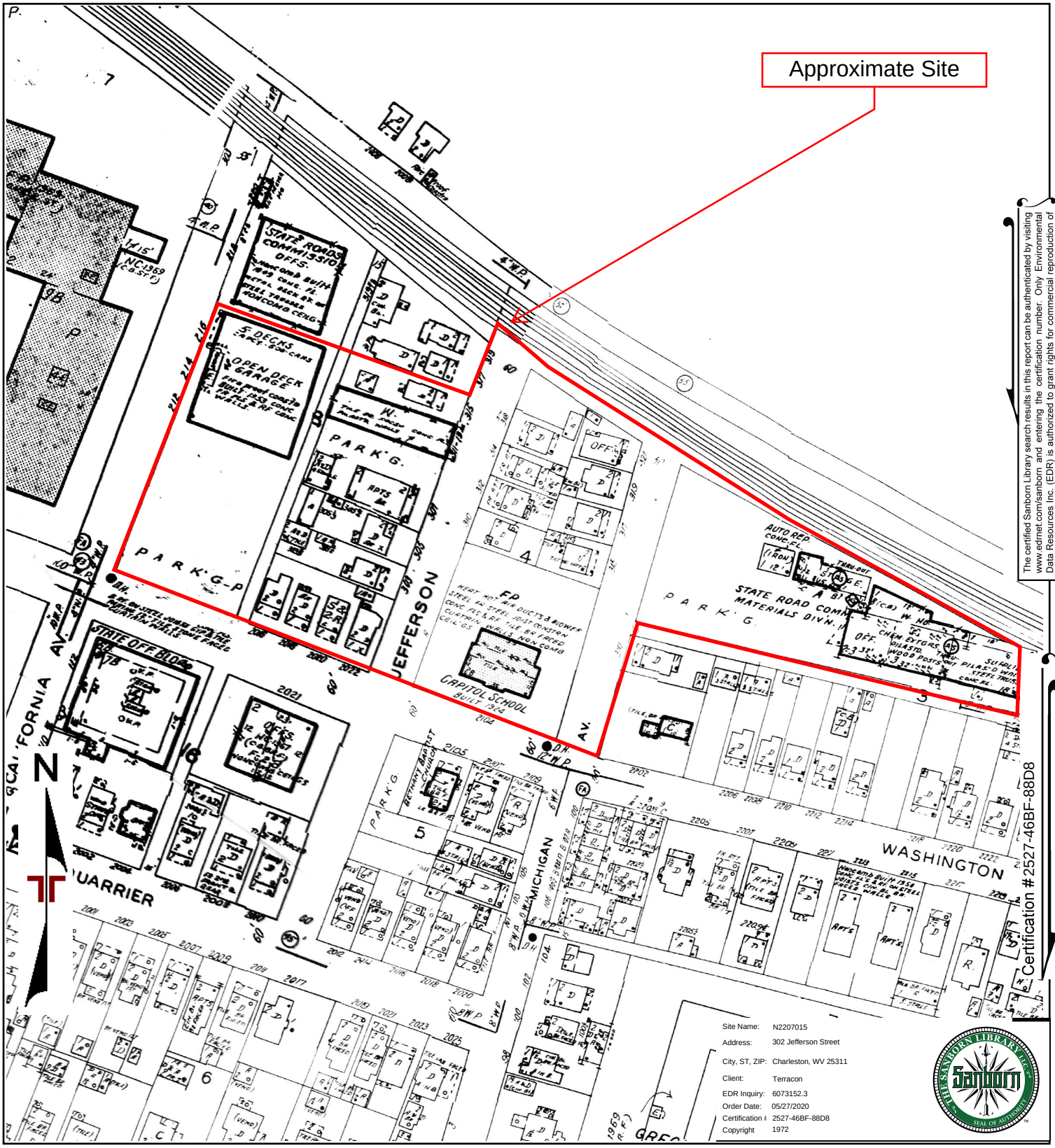
Certification # 2527-46BF-88D8



Volume 1, Sheet 28
Volume 1, Sheet 27

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1989 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix: C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1989		



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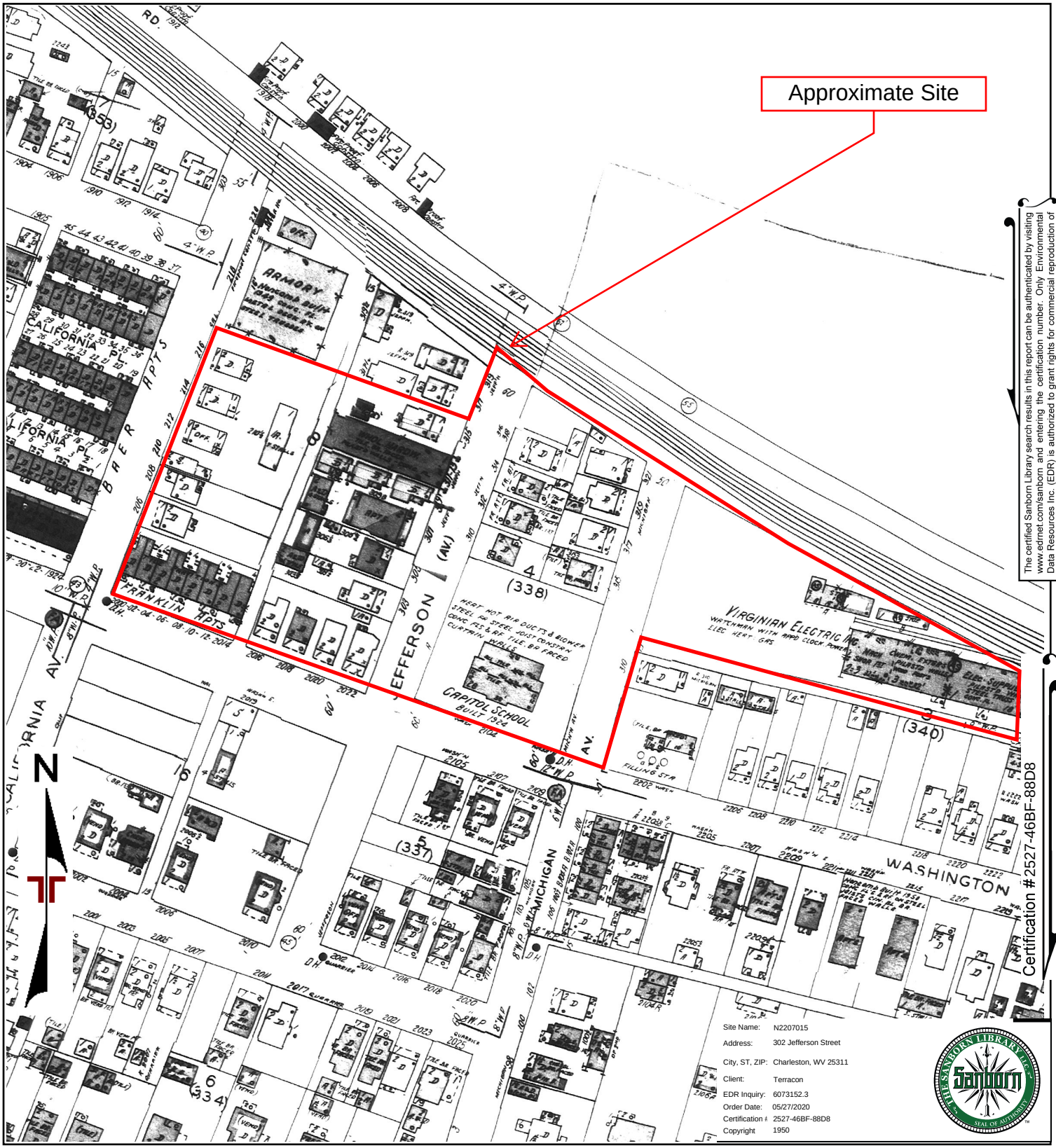
Certification # 2527-46BF-88D8



Volume 1, Sheet 28
Volume 1, Sheet 27

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1972 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix: C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1972		



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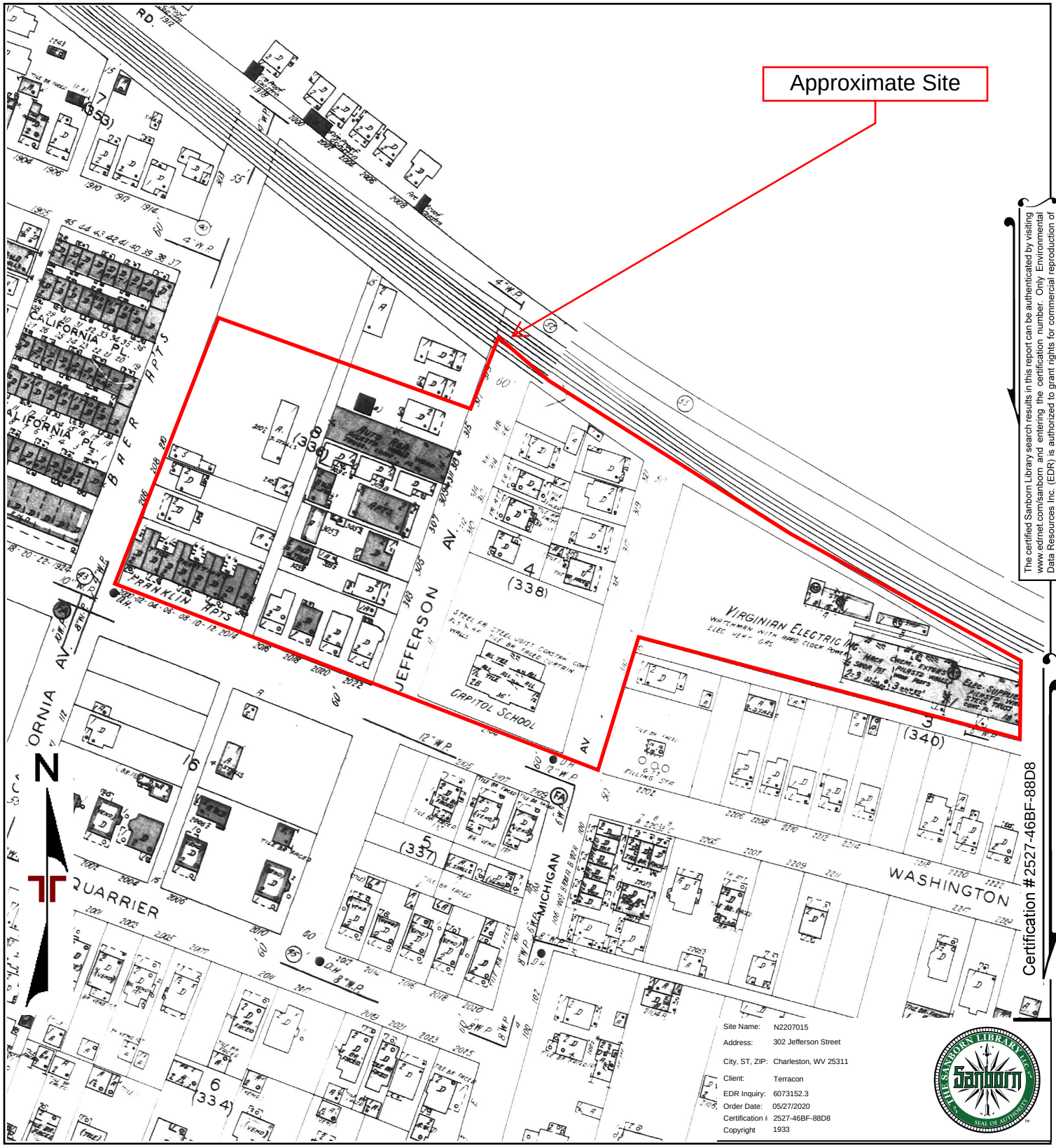
Certification # 2527-46BF-88D8



Volume 1, Sheet 28
Volume 1, Sheet 27

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1950 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix: C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1950		



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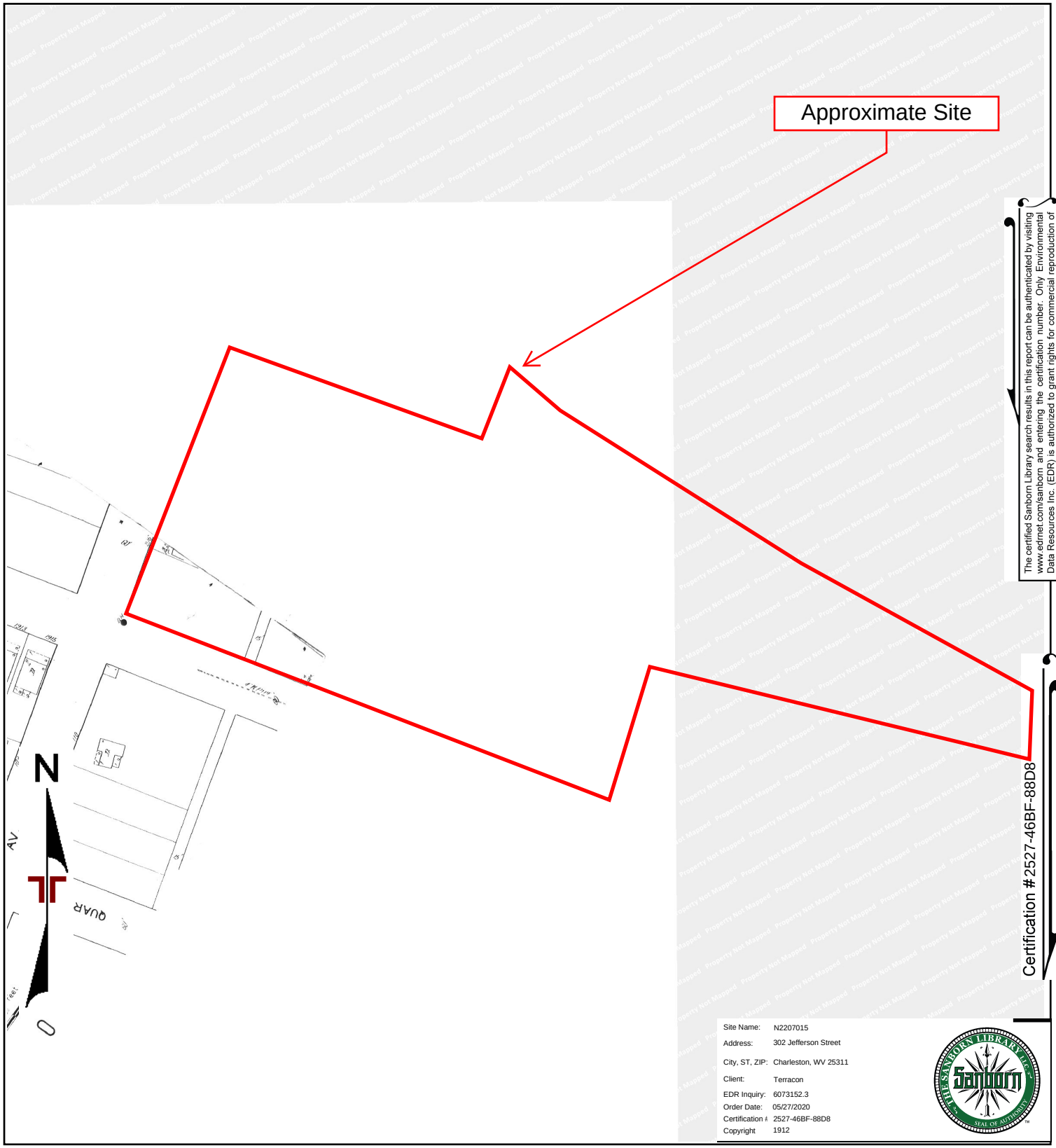
Certification # 2527-46BF-88D8



Volume 1, Sheet 28
Volume 1, Sheet 27

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1933 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311	Appendix C
Drawn By: LJS	Scale: As Shown			
Checked By: JBS	File Name: Sanborns			
Approved By: JBS	Date: 1933			



Volume 1, Sheet 37

37

0 Feet 150 300 600

Project Manager: LJS	Project No: N2207015	Terracon 912 Morris Street Charleston, WV 25301	1912 SANBORN MAP N2207015 302 Jefferson Street Charleston, WV 25311
Drawn By: LJS	Scale: As Shown		Appendix C
Checked By: JBS	File Name: Sanborns		
Approved By: JBS	Date: 1912		

N2207015
302 Jefferson Street
Charleston, WV 25311

Inquiry Number: 6073152.5
May 29, 2020

The EDR-City Directory Image Report

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

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Findings

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

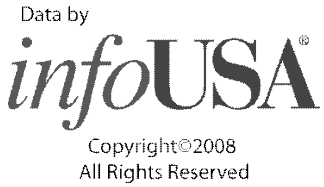
DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Report is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Report includes a search of available city directory data at 5 year intervals.

RECORD SOURCES

EDR's Digital Archive combines historical directory listings from sources such as Cole Information and Dun & Bradstreet. These standard sources of property information complement and enhance each other to provide a more comprehensive report.

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RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. A check mark indicates where information was identified in the source and provided in this report.

Year	Target Street	Cross Street	Source
2017	☑	☑	EDR Digital Archive
2014	☑	☑	EDR Digital Archive
2010	☑	☑	EDR Digital Archive
2005	☑	☑	EDR Digital Archive
2000	☑	☑	EDR Digital Archive
1995	☑	☑	EDR Digital Archive
1992	☑	☑	EDR Digital Archive
1987	☑	☐	POLK DIRECTORY CO
1983	☑	☑	POLK DIRECTORY CO
1982	☑	☐	POLK DIRECTORY CO
1978	☑	☐	POLK DIRECTORY CO
1977	☑	☐	POLK DIRECTORY CO
1973	☑	☐	POLK DIRECTORY CO
1972	☑	☐	POLK DIRECTORY CO
1968	☐	☐	POLK DIRECTORY CO
1967	☑	☐	POLK DIRECTORY CO
1963	☑	☐	POLK DIRECTORY CO

EXECUTIVE SUMMARY

Year	***Target Street***	***Cross Street***	***Source***

FINDINGS

TARGET PROPERTY STREET

302 Jefferson Street
Charleston, WV 25311

Year	*CD Image*	*Source*

JEFFERSON ST

2017	pg A1	EDR Digital Archive
2014	pg A5	EDR Digital Archive
2010	pg A9	EDR Digital Archive
2005	pg A13	EDR Digital Archive
2000	pg A17	EDR Digital Archive
1995	pg A21	EDR Digital Archive
1992	pg A25	EDR Digital Archive
1987	pg A29	POLK DIRECTORY CO
1987	pg A30	POLK DIRECTORY CO
1983	pg A37	POLK DIRECTORY CO
1983	pg A38	POLK DIRECTORY CO
1978	pg A45	POLK DIRECTORY CO
1973	pg A51	POLK DIRECTORY CO
1967	pg A58	POLK DIRECTORY CO
1963	pg A65	POLK DIRECTORY CO
1963	pg A66	POLK DIRECTORY CO

FINDINGS

CROSS STREETS

Year	*CD Image*	*Source*	
MICHIGAN AVE			
2017	pg. A2	EDR Digital Archive	
2014	pg. A6	EDR Digital Archive	
2010	pg. A10	EDR Digital Archive	
2005	pg. A14	EDR Digital Archive	
2000	pg. A18	EDR Digital Archive	
1995	pg. A22	EDR Digital Archive	
1992	pg. A26	EDR Digital Archive	
1983	pg. A39	POLK DIRECTORY CO	
PIEDMONT RD			
2017	pg. A3	EDR Digital Archive	
2014	pg. A7	EDR Digital Archive	
2010	pg. A11	EDR Digital Archive	
2005	pg. A15	EDR Digital Archive	
2000	pg. A19	EDR Digital Archive	
1995	pg. A23	EDR Digital Archive	
1992	pg. A27	EDR Digital Archive	
1983	pg. A40	POLK DIRECTORY CO	
1983	pg. A41	POLK DIRECTORY CO	
VIRGINIA TER			
2017	-	EDR Digital Archive	Target and Adjoining not listed in Source
2014	-	EDR Digital Archive	Target and Adjoining not listed in Source
2010	-	EDR Digital Archive	Target and Adjoining not listed in Source
2005	-	EDR Digital Archive	Target and Adjoining not listed in Source
2000	-	EDR Digital Archive	Target and Adjoining not listed in Source
1995	-	EDR Digital Archive	Target and Adjoining not listed in Source
1992	-	EDR Digital Archive	Target and Adjoining not listed in Source
1987	-	POLK DIRECTORY CO	Street not listed in Source
1983	-	POLK DIRECTORY CO	Street not listed in Source
1978	-	POLK DIRECTORY CO	Street not listed in Source

FINDINGS

Year	CD Image	Source	
1973	-	POLK DIRECTORY CO	Street not listed in Source
1968	-	POLK DIRECTORY CO	Street not listed in Source
1963	-	POLK DIRECTORY CO	Street not listed in Source

WASHINGTON ST E

2017	pg. A4	EDR Digital Archive
2014	pg. A8	EDR Digital Archive
2010	pg. A12	EDR Digital Archive
2005	pg. A16	EDR Digital Archive
2000	pg. A20	EDR Digital Archive
1995	pg. A24	EDR Digital Archive
1992	pg. A28	EDR Digital Archive
1983	pg. A42	POLK DIRECTORY CO
1983	pg. A43	POLK DIRECTORY CO

City Directory Images

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 2017

601	MARK, VEGA
603	WASHBURN, CAROLE S
604	SHEETS, RANDALL W
605	FARREN, MICHAEL K
606	BRADLEY, JOHNNY R
608	KINDER, JESSICA E
704	CASTLEBERRY, LORENA V
706	BELCHER, RANDY L
709	MCDANIEL, JAMES
710	NGUYEN, VINH T
711	HIVELY, DAVID
713	CROUSER, RICHARD W
714	GLAZIER, PAMELA S
715	BOWLES, TERESA E
716	LEGG, STANLEY G
717	HUNTER, ROSEMARIE H

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 2017

98	HAMILTON, DOROTHY L
100	COLE, PATRIC
101	SUTTON, ROBERT

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 2017

1511	MANSCALCHI, ARGHIE
1517	DAVID, JAMES
	DAVIS, CECIL E
	LEACH, LAYTON C
1519	ALLEN, SHAWN A
1521	GORE, WILBERT C
1523	HAIRSTON, JAMES M
1533	RUFFIN, WILLIE H
1539	KENNEDY, C
1541	FISHER, ERICA
1545	TYSON, CHARLES
1547	PENN, JACQUELINE
2878	BIBLE BAPTIST CHURCH
2882	SOUTHERN BUILDING SYSTEMS
2908	CHADWELL, THOMAS
2910	KING, BRENDA J
2912	JORDAN, TIM A
2926	CARTE, PAMELA J
2930	KANAWHA VALLEY MAINTENANCE LLC
2932	BARIA, RICKY L
2934	EPLIN, LOUISE
2936	LAMAR
3062	SLACK, HENRY W

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 2017

2205	VINCENT LUSTIG PHD
2207	WEST VIRGINIA COUNCIL OF CHURCHES
2209	BATTLE, KIYE
	ROBINSON, CHARMAINE N
2210	WV OPTOMETRIC ASSOCIATION
2213	SHANKLIN, CYNTHIA R
	SMITH, DAMON T
	SMITH, DEBRA E
	TANNER, ROBERT
2214	WEST VIRGINIA HOUSING INSTITUTE INC
2215	GARDNER, KAYLA
	SAYLES, LEONARD
	STRAUGHTER, JAMES R
	WATSON, AMECHE L
2219	LYNCH, KNOX
2220	HOME BUILDERS ASSOCIATION
	WEST VIRGINIA SCHOOL BOARDS ASSOCIAT
2222	BURDETTE, TERESA M
2224	SMITH, KEISHA
2228	MARTINEZ, MARIA
	MOORE, ERNEST C
2300	PRATT, WAVEY E
2301	HUTTON, PAUL A
	LEMLE, MITCH
	SAINATO, BILL A
	THOMAS, SHERRI L
	WOODING, ANGELIA M

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 2014

601	KATRINA, TUCKER
603	WASHBURN, CAROLE S
604	SHEETS, RANDALL W
605	FARREN, MICHAEL K
606	OCCUPANT UNKNOWN,
608	KINDER, JESSICA E
704	CASTLEBERRY, LORENA V
706	BELCHER, RANDY L
707	STRAIN, LOIS J
709	MCDANIEL, JAMES
710	ZINNER, RICHARD C
711	HIVELY, DAVID
712	OCCUPANT UNKNOWN,
713	CROUSER, RICHARD W
714	GLAZIER, PAMELA S
715	BOWLES, TERESA E
716	LEGG, STANLEY G
717	CONNICK, MICHAEL E
	STATE OF WEST VIRGINIA

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 2014

3	JUSTICE AUTO SALES INC
	LOGAN CENTER
	LOGAN COUNTY SCHOOL EMPLOYEES FEDERA
	LOGAN HEALTH VILLAGE
	LOGAN MINGO AREA MENTAL HEALTH INC
	LOGAN MINGO MH INC
	SAVWAY FOODS
	USAVE AUTO RENTAL
36	KNABENSHUE, J M
98	HAMILTON, DOROTHY L
100	LOWER, RANDY
101	MENDEZ, DIANA
	OCCUPANT UNKNOWN,
103	OCCUPANT UNKNOWN,
108	ARMSTEAD, WESLEY C
	BREWER, JAMES W
315	OCCUPANT UNKNOWN,

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 2014

1511	OCCUPANT UNKNOWN,
1513	ROSS, LINDA J
1517	DAVIS, CECIL C
	RAMSEY, JAMES
1519	ALLEN, SHAWN A
1521	OCCUPANT UNKNOWN,
1523	HAIRSTON, JAMES M
1525	GIBSON, LESLIE
1527	NEWMAN, SHERY
1533	RUFFIN, WILLIE H
1537	OCCUPANT UNKNOWN,
1545	TYSON, CHARLES
1547	PAGE, S
2878	BIBLE BAPTIST CHURCH
2882	SOUTHERN BUILDING SYSTEMS
2908	OCCUPANT UNKNOWN,
2910	KING, BRENDA J
2912	JORDAN, TIM A
2926	CARTE, PAMELA J
2930	KANAWHA VALLEY MAINTENANCE
2932	BARIA, RICKY
2934	EPLIN, LOUISE
2936	LAMAR
3062	SLACK, HENRY W

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 2014

2200	STATE OF WEST VIRGINIA
	THE STATE CREDIT UNION
	WEST VIRGINIA STATE OF CONTINUED
2205	AUDIOLOGY & HEARING AID SERVICES
	ENGLE ASHLEY AUD
	LUSTIG VINCENT PHD
2207	WEST VIRGINIA COUNCILCHURCHES
2209	DARBY, KATERINE
	ENGLISH, CAROLYN
	PENNINGTON, MICHAEL
	WILLIAMS, GARRETT
2210	WV OPTOMETRIC ASSOCIATION
2211	WEST VIRGINIA ASSOCIATION OF COUNTIE
2212	OCCUPANT UNKNOWN,
2213	ALLRED, WILLIAMS
2214	WEST VIRGINIA HOUSING INSTITUTE INC
2215	BEAN, KARL M
	ROBINSON, CHARMAINE N
	STRAUGHTER, JAMES R
	WATSON, AMECHE L
2218	OCCUPANT UNKNOWN,
2219	WILLIAMS, BOBBY R
2220	HOME BUILDERS ASSOCIATION OF WEST VI
	SAJID, BRENDA
	WEST VIRGINIA SCHOOL BOARDS ASSOCIAT
2222	BURDETTE, TERESA M
2224	LAWTON, ANDREKIA
2228	KHAN, MO A
	MILLER, KAMERON T
	SCOTT, TERESA L
	WOODY, S
2300	PRATT, WAVEY E
2301	ESKINS, MARY
	SAINATO, BILL A
	THOMAS, SHERRI L
	WOODING, ANGELIA M

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 2010

601	TUCKER, KATRINA D
603	WASHBURN, CAROLE S
604	SHEETS, JONATHAN E
605	FARREN, MICHAEL K
606	PERRY, NEIL
608	SANDERLIN, ALTIA L
704	RIFFLE, OTIS D
707	RODGERS, AMBER
708	OCCUPANT UNKNOWN,
709	MCDANIEL, JAMES
710	BICKERSTAFF, JAMES J
711	HIVELY, CARLOS R
712	WINFREE, MORGAN M
713	CROUSER, RICHARD W
714	GLAZIER, PAMELA S
715	BOWLES, DAVID C
716	LEGG, STANLEY G
717	CONNICK, MICHAEL E

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 2010

36	KNABENSHUE, J M
50	CORNER PUB
98	HAMILTON, DEBRA L
100	BURDETTE, L
	LOWER, RANDY
	THOMAS, GORDON W
101	MENDEZ, DIANA A
	OCCUPANT UNKNOWN,
103	OCCUPANT UNKNOWN,
106	DOUGLAS, TONY E
	HIGGINBOTHAM, SAMANTHA
	PERRY, KRIS A
108	ARMSTEAD, WESLEY C
315	RAMSAW, RICKY A

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 2010

1511	OCCUPANT UNKNOWN,
1513	LEMARIER, MITZI
1517	DAVIS, KELLI A
	LEWIS, AMY L
	RAMSEY, JAMES
1519	ALLEN, SHAWN A
1521	GORE, WILBERT C
1523	HAIRSTON, JAMES M
1525	GIBSON, LESLIE
1527	OCCUPANT UNKNOWN,
1531	STAFFORD, PATRICIA L
1533	RUFFIN, WILLIE H
1537	OCCUPANT UNKNOWN,
1541	WHITE, JAMES K
1545	TYSON, ARTHUR L
1547	PAGE, S
1549	KANAWHA COUNTY BOARDEDUCATION
2878	BIBLE BAPTIST CHURCH
2882	SOUTHERN BUILDING SYSTEMS INC
2902	TOM E BOYS FUN STUFF
2908	HARRIS, CHRISTY
2910	BARTLEY, CHUCK W
2912	SULLIVAN, DAVID M
2926	CARTE, PAMELA J
2930	KANAWHA VALLEY MAINTENANCE LLC
2934	EPLIN, PAUL F
2936	LAMAR ADVERTISING CO
	SHAFFER, GINA M
3062	SLACK, HENRY W

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 2010

2018 OCCUPANT UNKNOWN,
2019 ADMINISTRATION DEPT PURCHASING
TRAVEL MANAGEMENT
2203 RICHARSON, KIZZY M
2205 AUDIOLOGY & HEARING AID SVC
2206 WV ENVIRONMENTAL COUNCIL
2207 WEST VIRGINIA COUNCILCHURCHES
WV COUNCIL OF CHURCHES
2209 HEILMAN, ROBERT E
LIFFRIG, MEGAN
MCCLURE, MISTY D
OCCUPANT UNKNOWN,
WILLIAMS, GARRETT
2210 COMPENSATION STRATEGIES INC
WEST VIRGINIA OPTOMETRIC ASSN
WV OPTOMETRIC ASSN
2211 WEST VIRGINIA ASSN OF COUNTIES
2212 OCCUPANT UNKNOWN,
2213 BURGER, TAMIAKA L
HARRIS, DENISE W
HENDERSON, REGINA R
QUINN, TAMIAKA
2214 WV HOUSING INSTITUTE INC
2215 LAIN, DAMITA
MCKEEVER, ANGIE W
STRAUGHTER, JAMES R
2218 OCCUPANT UNKNOWN,
2219 COLEMAN, JOHN
2220 HOME BUILDERS ASSN OF WV
2222 LANE, SHONTAY
2224 HARRIS, CYNTHANIA
2228 BREWSTER, DANIEL
MCNEELY, CHARLES E
2300 PRATT, WAVEY G
2301 RENALDI, BRITTANY
SAINATO, BILL A
THOMAS, SHERRI L

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 2005

601	TUCKER, KATRINA D
604	SHEETS, RANDALL
605	FARREN, MICHAEL
606	DOIG, CHARLES
608	SANDERLIN, ALTIA L
704	CASTLEBERRY, KELLY L
707	CRAWFORD, FONDA
708	BELCHER, RANDY L
710	ELLIS, LONNIE
711	HIVELY, CARLOS W
713	CROUSER, RICHARD W
714	GLAZIER, PAMELA S
715	BOWLES, LAURA Z
716	LEGG, STANLEY G
717	GILL, RONDAL M

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 2005

2	TAYLOR, RUTH J
3	FREDERICK, G
	IRE ITAL
	IRE ITAL LLC
4	CANTLEY, BEULAH E
36	KNABENSHUE, J M
98	HAMILTON, DEBRA L
101	OCCUPANT UNKNOWN,
102	TAGOE, LYNDON T
103	LAWSON, PATRICIA J
106	HAYES, PATRICK
	OCCUPANT UNKNOWN,
	STRAUGHTER, JAMES
108	BREWER, JAMES W
	CHUNG, SAM
	KIRK, PAUL
	MATHIS, SUZANNE E
	MCDOWELL, MEGHAN
	THOMPSON, STEVEN A
312	CONTRACT ADMINISTRATION
315	HAMILTON, ABAKA M

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 2005

1513	HOLBROOK, LOUANNA A
1517	CHILDS, MARGARET A
	DAVIS, CECIL E
1519	ALLEN, SHAWN A
1521	OCCUPANT UNKNOWN,
1523	BRANCH BANKING & TRUST
	HAIRSTON, JAMES M
1527	NEWMAN, G
1531	STAFFORD, PATRICIA L
1533	RUFFIN, WILLIE H
1537	PANNELL, PAUL
1543	HOPKINS, EDNA J
1545	TYSON, ARTHUR L
1547	PAGE, LARRY D
2902	WYRD GAMES INC
2908	OCCUPANT UNKNOWN,
2910	HIGH, PAUL T
2912	SULLIVAN, DAVID M
2926	CARTE, PAMELA J
2932	MOLLINS, J C
2934	EPLIN, PAUL F
2936	SHAFFER, DANIEL C
3062	OCCUPANT UNKNOWN,

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 2005

2018	OCCUPANT UNKNOWN,
2019	ADMINISTRATION WEST VA DEPT
2203	BENI, PAUL
	COOK, WARREN
	COURTS, C
	ELLIS, NORMA J
	HAWTHORNE, CHARLES
	KYTE, JOYCELYN A
	MITCHELL, RILEY
	RICHARDSON, JAMES R
	THOMPSON, JOYCE
	THOMPSON, STEVEN A
2209	AUSTIN, STELLE M
	HENSON, FRELON C
	MUSE, MARY
	PETRY, TIMOTHY
	SULLIVAN, DAVID M
	TOTAL QUALITY ORGANIZATION
2210	COMPENSATION STRATEGIES INC
	OCCUPANT UNKNOWN,
	WEST VIRGINIA CHIROPRACTIC SOC
2211	HOFF, JOHN
2212	OCCUPANT UNKNOWN,
2213	ALBRIGHT, JOSEPH P
	PENN, M
	THOMAS, HABEEBAH
2215	EASTMAN, BOBBI J
	MCKEEVER, EUGENE F
2218	OCCUPANT UNKNOWN,
2219	TOWNSEND, CARL
2221	ABNER, N
2222	MILLER, V
2224	HARRIS, DORETHA E
2226	ADKINS, DEBRA L
	LATTA, DIONNE
	MORRIS, J
2228	BAYES, ROBERT D
	DANIELS, ANGELA
	KENT, GARY
	LEDSOME, DAVID
	MCNEELY, CHARLES
	NUTTER, KRYSTINA D
	SETLIFF, BOBBY
2300	PRATT, WAVEY G
2301	CUNNINGHAM, CHAUNCY C
	HAYWARD, RICHARD D
	PACK, CHARLES F
	SAINATO, BILL A
	THOMAS, SHERRI L
	WILCOX, KENNETH

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 2000

601	TUCKER, KATRINA
603	OCCUPANT UNKNOWN,
604	OCCUPANT UNKNOWN,
605	COLEMAN, WALTER
606	DOLAN, CHARLES E
608	PECK, DENVER K
704	CASTLEBERRY, KELLY L
707	OCCUPANT UNKNOWN,
708	MALLORY, ELAINE
709	BACKUS, ELMO H
710	BICKERSTAFF, JACK J
711	WILSON, EDWIN S
712	NEALE, DONNA G
713	CROUSER, RICHARD W
715	BOWLES, LAURA Z
716	LEGG, STANLEY
717	GILL, RONDAL

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 2000

2	REID, EVERETT L
3	CHAFIN, TODD J
98	HAMILTON, DEBRA L
100	COLEMAN, NITA V
	HOOD, LARRY
	KWEI-TAGOE, LYNDON T
	PABLO, F C
	TAGOE, A K
101	OCCUPANT UNKNOWN,
103	LAWSON, P
106	THOMAS, CLEOLA
108	BATTEN, V
	BURRELLS, DARLENE
	DANIELS, MELVIN E

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 2000

1513	HOLBROOK, ADALINE
1517	CHILDS, M A
	HARRIS, ROBIN L
1519	STRAUGHTER, SHAWN
1521	GORE, BARBARA A
1523	HAIRSTON, JAMES
	JEFFERSON, MAYME
1527	OCCUPANT UNKNOWN,
1531	STAFFORD, P L
1533	OCCUPANT UNKNOWN,
1537	PANNELL, PAUL
1539	WILLIAMS, B L
1543	HOPKINS, EDNA
1545	OCCUPANT UNKNOWN,
1547	PENN, JEFF
2878	BIBLE BAPTIST CHURCH
2882	SOUTHERN BUILDING SYSTEMS INCORPORATED
2908	OCCUPANT UNKNOWN,
2912	SULLIVAN, DAVID
2930	KANAWHA VALLEY MAINTENANCE
2931	CURIOUS GOODS
	WINANS SANITARY SUPPLY COMPANY
2934	EPLIN, PAUL F
3062	SLIMICK, FRANCES

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 2000

2019	WEST VIRGINIA STAT OF ADMINISTRATION DEPARTMENT OF SECY
2022	CARR, JOSEPH L
2023	OCCUPANT UNKNOWN,
2200	WEST VIRGINIA STAT OF PUB EMPLOYEES CREDIT UN
2203	COOK, RUTH C
	THOMPSON, JOYCE
2205	AUDIOLOGY AND HEARING AID SERVICES INCORPORATED
	LUSTIG VINCENT F DR
2206	CENTRAL W V AGING SERVICES INCORPORATED
	W VA SCHOOL BOARD ASSOCIATION
	W VA SCHOOL BOARDS ASSOCIATION
2207	OCCUPANT UNKNOWN,
2208	OCCUPANT UNKNOWN,
2209	AUSTIN, STELLE
	BROWN, ANNETTE M
	WELDON, B
2210	COMPENSATION STRATEGIES INCORPORATED
	WEST VIRGINIA CHIROPRACTIC SOCIETY
2211	HOFF JOHN D
	REPAIR ASSOCIATES INCORPORATED
	WEST VIRGINIA ASSOCIATION OF COUNTIES
2212	CHANDLER, KEVIN D
2213	ALBRIGHT, JOSEPH P
	GOLDBERG, ROBERT D
2214	BRUNELL, JOHN E
2215	YEAGER, V
2218	MEEKS, GWEN
2220	WHITE, MIKE
2221	MILLER, ROXANNE
2224	OCCUPANT UNKNOWN,
2226	KING, JOHN E
	YATES, CONNIE M
2300	OCCUPANT UNKNOWN,
2301	PACK, C
	ROSSANO, T R
	THOMAS, SHERRI

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 1995

601	MCGREW, FRANK A JR
603	WASHBURN, CHARLES J
604	SHEETS, RANDALL W
605	COLEMAN, WALTER
606	DOLAN, CHARLES E
608	PECK, DENVER K
704	CASTLEBERRY, KELLY L
706	ERWIN, MINNIE B
707	ACREE, ANNA B
708	MALLORY, ELAINE
709	BACKUS, WILLIAM F
710	OCCUPANT UNKNOWNN
711	WILSON, EDWIN S
712	NEALE, DONNA G
713	CROUSER, RICHARD W
714	GLAZIER, PAMELA S
715	BOWLES, LAURA Z
716	LEGG, STANLEY III
717	GILL, RONDAL

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 1995

3	KINNEY, C
98	HAMILTON, DEBRA L
100	OCCUPANT UNKNOWNN
101	BROWN, STEPHEN L
	CRAWFORD, BETTY J
	WITT, LENA
103	KOONTZ, HERMIS D
106	THOMAS, CLEOLA
108	BATTEN, V
	JOHNSON, GREG E
	TAYLOR, DAVID JR
312	MATERIALS CONTROL
315	HAMILTON, EVELYN D
319	OCCUPANT UNKNOWNN

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 1995

1511	WOODS, CAROLL
1513	HOLBROOK, ADALINE
1515	PHILLIPS, RUTH M
1517	CHILDS, M A
1519	HARRIS, GEORGE
1523	HAIRSTON, JAMES
1525	HAIRSTON, C
1527	OCCUPANT UNKNOWNN
1531	STAFFORD, WILLIAM E
1533	OCCUPANT UNKNOWNN
1537	PANNELL, PAUL
1539	WILLIAMS, BETTIE L
1541	RIFFLE, VADA
1543	HOPKINS, EDNA J
1547	CANTERBURY, DEANNA L
	PENN, JEFF
2878	BLOUNT, JAMES W
2882	SOUTHERN BUILDING SYSTEMS INC
2902	BECKS HOME IMPROVEMENTS INC
2912	SULLIVAN, DAVID
2926	OCCUPANT UNKNOWNN
2930	KANAWHA VALLEY MAINTENANCE
	OCCUPANT UNKNOWNN
2931	WINANS SERVICES
2934	EPLIN, PAUL F
2936	OCCUPANT UNKNOWNN
3062	SLIMICK F MRS RN
	SLIMICK, FRANCES

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 1995

2016	BALLARD, WILLIAM R
2018	JETT, LUTHER T
2020	OCCUPANT UNKNOWNN
2022	CAREY CONSTRUCTION
	CCI
	OCCUPANT UNKNOWNN
2200	ONE VALLEY BANK
	ONE VALLEY BANK NA
2203	COOK, RUTH C
	GEHRINGER, LEWIS E
	THOMPSON, JOYCE
	WAYBRIGHT, TODD
2205	AUDIOLOGY & HEARING AID SVC
	JEFFERSON, CHERYL L
	LUSTIG, VINCENT F
	SIMMERMAN, GREG
2206	OCCUPANT UNKNOWNN
	WEST VIRGINIA SCHL BOARD ASSN
2207	OKES, DONALD E
2208	EASTON, MARIE
2209	JACKSON, KIM Y
2210	OCCUPANT UNKNOWNN
2211	HOFF, JOHN
	RPR ASSOC INC
	WEST VIRGINIA ASSN OF COUNTIES
2212	OCCUPANT UNKNOWNN
2213	HARPER, R E
	LILLY, SUSAN M
	LOPEZ, LINDA
2214	BRUNELL, JOHN E
2215	FEIOCK, SUSAN R
	GALLAGHER, CLARA
	MARTIN, NELSON
	PENN, JARNICE
	YEAGER, V
2217	CONNER, JUDY C
2218	MARKS, PHYLLIS
2219	MCMILLEN, NANCY P
2220	FISH, ANTHONY B JR
2221	BOSWELL, FRANCES
2222	OCCUPANT UNKNOWNN
2224	SHOATS, LINDA
2225	CARPENTER, L
2226	BAILEY, LARRY
	HARRIS, LEE
	WHITESTONE, FRANK
2301	HAYWARD, PAMELA
	RAIDER, JONATHO S
	ROSSANO, T R
	SIANATO, WILLIAM A

Target Street	Cross Street	Source
✓	-	EDR Digital Archive

JEFFERSON ST 1992

601	MCGREW, FRANK A JR
604	SHEETS, RANDALL W
605	COLEMAN, WALTER
606	DOLAN, CHARLES E
608	PECK, DENVER K
704	CASTLEBERRY, KELLY II
707	ACREE, CHARLES O
708	FRAME, MICHAEL E
710	FRAME, HARRY
712	NEALE, DONNA G
713	CROUSER, RICHARD W
715	BOWLES, LAURA Z
717	GILL, RONDAL

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

MICHIGAN AVE 1992

98	COOK, C
101	BROWN, STEPHEN L
103	KOONTZ, HERMIS D
106	GIVEN, LENA G
	STRAUGHTER, JAMES R
204	BROOKS, GARY L
1082	BATTEN, V
1083	TAYLOR, DAVID JR
1084	CYRUS, R A
10112	CRAWFORD, B J

Target Street	Cross Street	Source
-	✓	EDR Digital Archive

PIEDMONT RD 1992

1515	PHILLIPS, RUTH M
1517	CHILDS, M A
1527	SYKES, E
1531	STAFFORD, WILLIAM E
1533	RUFFIN, G
1537	CONAWAY, J L
	PANNELL, PAUL
1539	WILLIAMS, BETTIE L
1543	HOPKINS, EDNA J
2878	BLOUNT, JAMES W
2882	SOUHERN BLDG SYSTEM
2902	BECKS HM IMPRVMNT
	BECKS UPHOLSTERY CO
	BECKS VENETIAN BLND
2912	TOWNSEND, THURMAN A
2931	WINANS SANITRY SUPL
	WINANS SERVICES
2934	EPLIN, PAUL F
2936	SHAFFER, JOE
3062	SLIMICK F MRS RN
	SLIMICK, FRANCES

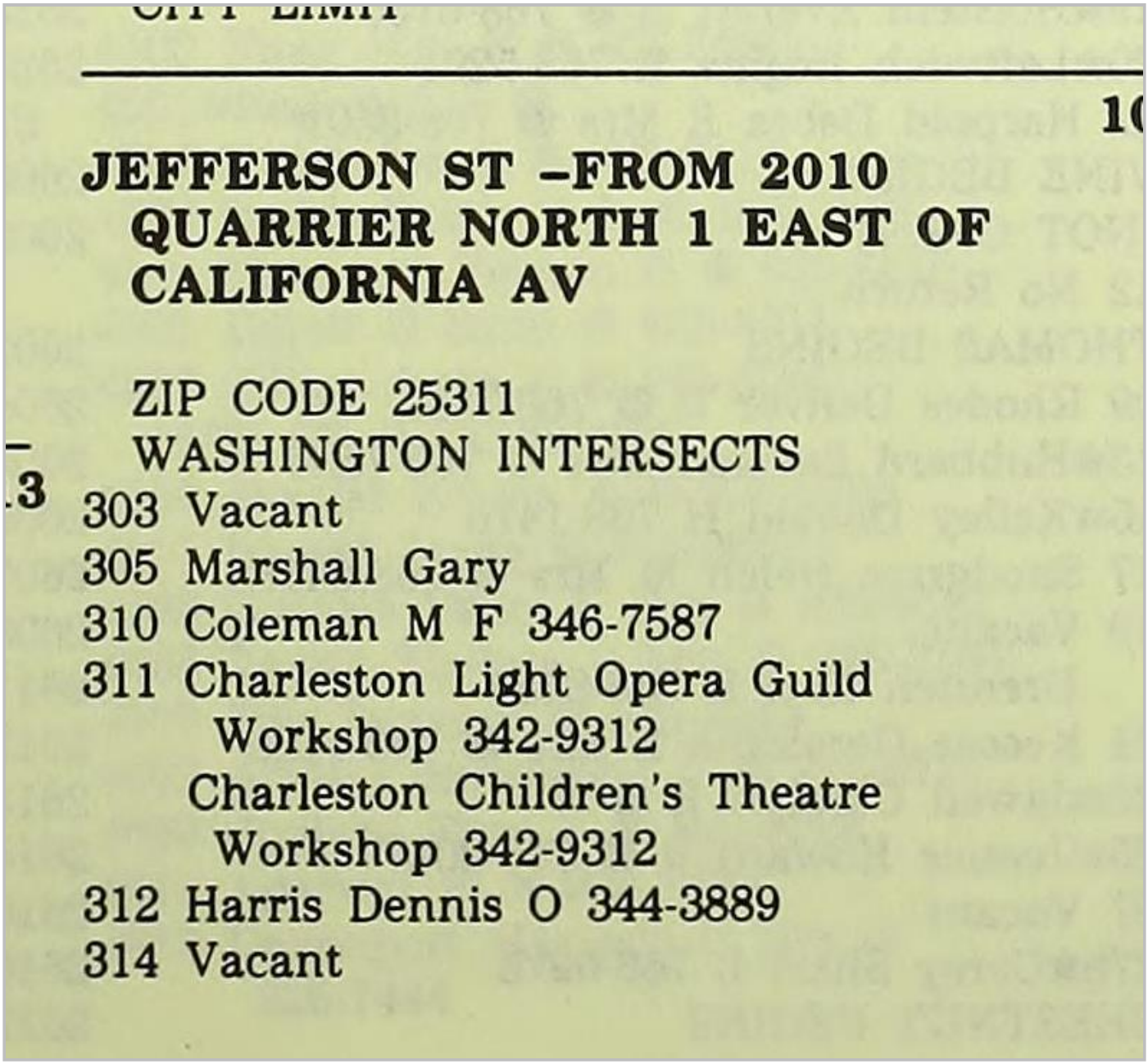
Target Street	Cross Street	Source
-	✓	EDR Digital Archive

WASHINGTON ST E 1992

2019	WV-INS COMMSNR
	WV-INS-LEGAL DIV
2100	ST-FIRE COMM ST
2101	WV TOURISM&PARK DIV
2200	ATLANTIC FINANCIAL
2205	AUDIOLOGY & HEARING
	LUSTIG VINCENT F DR
2206	W VA SCHL BD ASSOC
2207	OKES, DONALD E
2208	EASTON, MARIE
2209	AUSTIN, STELLE
	LOPEZ, ALVINO
2210	CASSIS, ALICE G
2215	DAVIS, ALLEN E
	GALLAGHER, CLARA
2217	DAVIS, JUDY C
2224	COMPU-TEL INC
	EVI-THE EXEC VALET
	TERRELL, D A
2225	FRANCE, C
2226	WHITESTONE FRANK
2302	FREEMAN, DONALD
2308	CHANDLER, RICHARD

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1987



CITY LIMIT

10

JEFFERSON ST –FROM 2010 QUARRIER NORTH 1 EAST OF CALIFORNIA AV

ZIP CODE 25311

WASHINGTON INTERSECTS

303 Vacant

305 Marshall Gary

310 Coleman M F 346-7587

311 Charleston Light Opera Guild Workshop 342-9312

Charleston Children's Theatre Workshop 342-9312

312 Harris Dennis O 344-3889

314 Vacant

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

315a★Sandoe Jackie 342-2589
315b Gibson Joan 345-5735
315c Vacant
317a No Return
317b Vacant
317c Patel Thakor 346-8726
317d Vacant
317e Vacant
318 Shawver Alton D ◎ 343-0847
319a★Parcelli Frank
319b Vacant
319½a Vacant

37

JEFFERSON ST (SOUTH CHARLESTON)–FROM WASHINGTON SOUTHEAST 1 NORTHEAST OF PARK ST

ZIP CODE 25309
601 Mc Graw Charlene M Mrs ◎ 744-4395
603 Withrow Charles D ◎ 744-6176
604 Sheet Randall W ◎ 744-9379
605 Coleman Walter ◎ 744-9094
606 Dolan Charles E ◎ 744-8407
608 Peck K Denver ◎ 744-0068
WASHINGTON INTERSECTS
704 Mc Elhinny Wayne H ◎ 744-5984
706 Erwin Minnie B Mrs ◎

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

10

MICHIGAN AV –FROM 2102 E KANAWHA BLVD NORTH 1 EAST CALIFORNIA AV

ZIP CODE 25311
QUARRIER ST ENDS
101 Vacant
101½ Crawford Betty J Mrs 345-3904
103 Koontz Hermis ◎ 346-7239
106★Given Lena G 342-8686
106b Pinkston Keith A
106½★Abbogt Sandra
★Straughter Barbara L 343-7509
108 Marphilben Apartments
1★Carter Shiree
2 Batten Beatrice Mrs 343-3262
3 Taylor David
4 Sayer
5 Straughter Herman B
6 Walker Roger J
WASHINGTON INTERSECTS
310★Hopkin Melissa F
310½ No Return
312 State Dept Hwys (Testing Div)
348-3043
315 Vacant
317a Vacant

103

MIDDLE RD –FROM 811 NEWTON RD

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

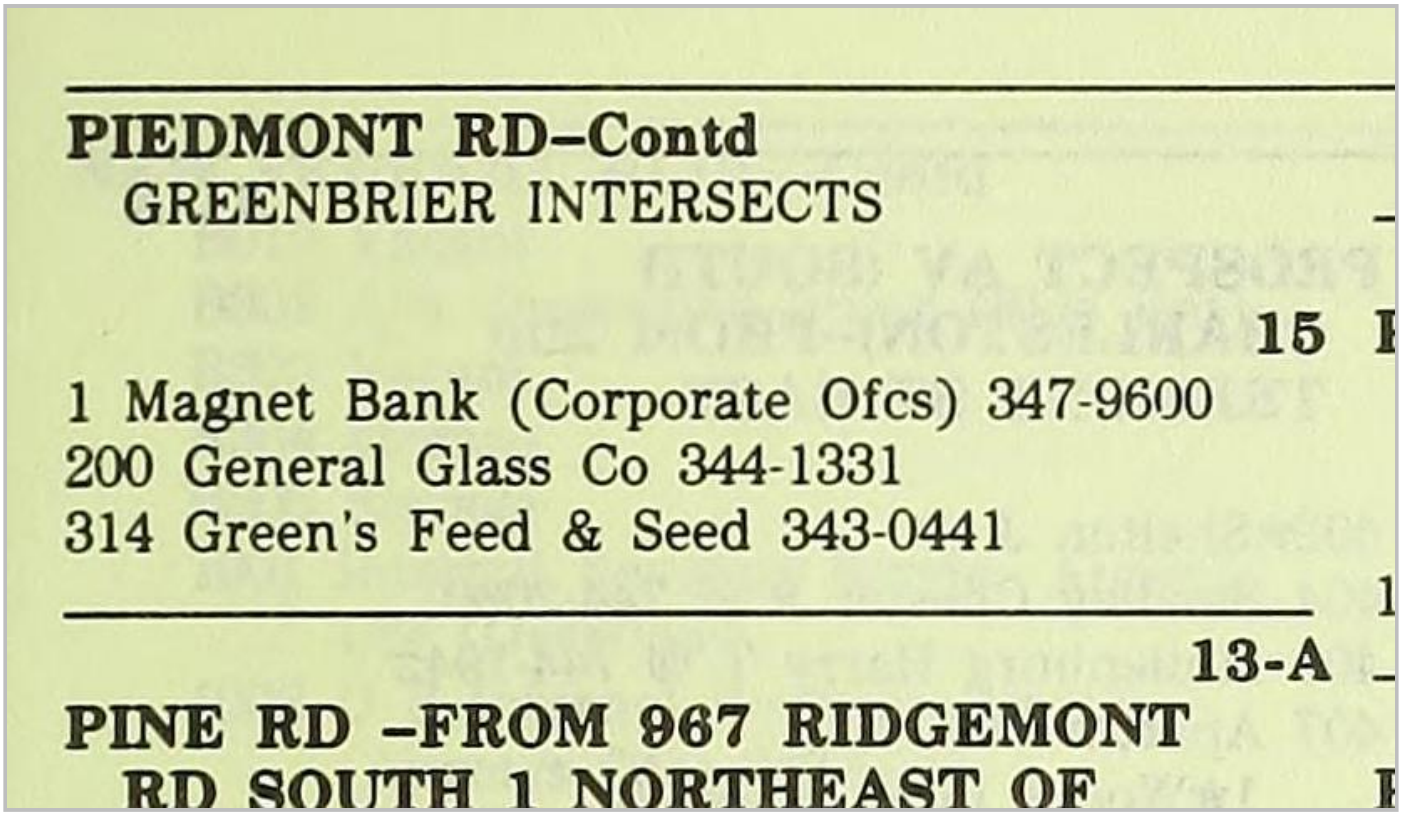
PIEDMONT RD 1987

PIEDMONT RD –FROM END OF CAPITOL ST SOUTHEAST 2 NORTH OF SMITH

ZIP CODE 25301
NUMBERS IRREGULAR
BROAD ENDS
S MAIN DR BEGINS
BROOKS ENDS
MORRIS ENDS
FARNSWORTH DR BEGINS
CHILTON ENDS
ZIP CODE 25311
1513 Holbrook John B ◎ 342-1859
CART ST ENDS
1515 Phillips Ruth M Mrs 343-7790
1517a Edwards Paula A 344-3040
1517b★Lamarr Vicky Y
1517c No Return
CARTE ST ENDS
1519 Shanholtzer Karl V ◎ 342-7388
1521 Gore Wilbur C ◎
1523 Gore Vickie J Mrs ◎ 342-7414
1525 Vacant
1527 Vacant
1531 Stafford Wm E ◎ 342-5392
1533 Mitchell Geo H ◎ 342-4973
1537 Pannell Paul 343-8738
1537a★Zegeer Paul
1539 Williams Bettie L ◎ 344-2015
THOMPSON ENDS
1541★Easley Angela
1543 Hopkins Edna Mrs ◎ 342-5615
1545 Page Larry ◎
STADIUM PL INTERSECTS
1547 Penn Jarnice T ◎
1549 Laidley Field park 348-1134
ELIZABETH INTERSECTS
CAROLINE ENDS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1987



PIEDMONT RD–Contd

GREENBRIER INTERSECTS

15

1 Magnet Bank (Corporate Ofcs) 347-9600
200 General Glass Co 344-1331
314 Green's Feed & Seed 343-0441

13-A

PINE RD –FROM 967 RIDGEMONT RD SOUTH 1 NORTHEAST OF

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1987

701

PIEDMONT RD –A CONTINUATION OF PIEDMONT RD (CHASN)

ZIP CODE 25311
2902 Becks Home Improvements 925-4322
2908 Vacant
2908½ Vacant
2910★Moore Jeff ◎ 925-6067
2912 Vacant
2926 Vacant
2930 Vacant
2931 Winans Maintenance 925-7049
2934 Eplin Paul F ◎ 925-4530
2936 Shaffer Danl
KANAWHA BLVD E INTERSECTS
3062 Slimick Geo A Jr ◎ 925-5190

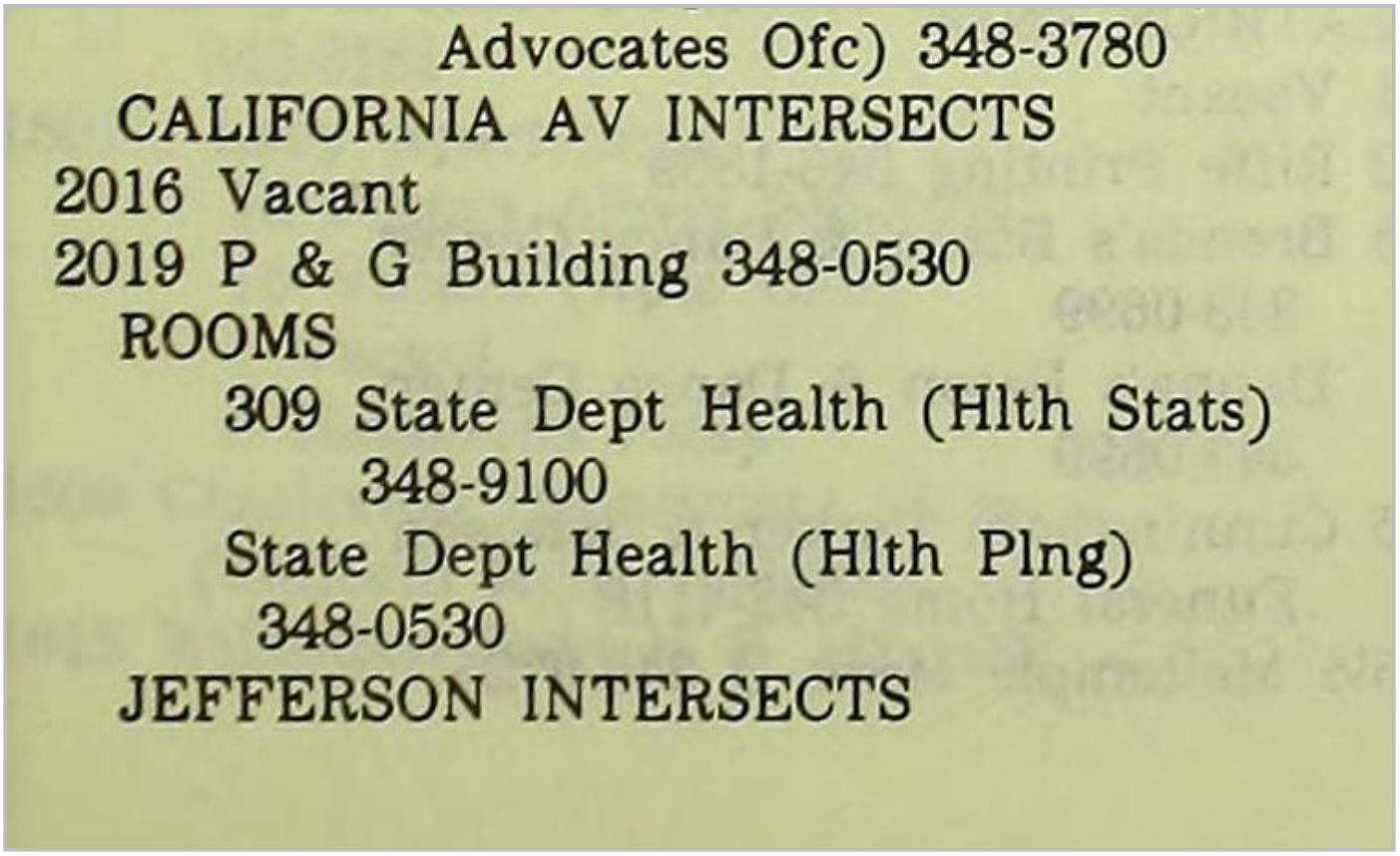
700

PIEDMONT RD (PORT AMHERST) FROM 101 DRY BRANCH DR EAST 1 NORTH OF KANAWHA BLVD

DRY BRANCH DR BEGINS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1987



Advocates Ofc) 348-3780
CALIFORNIA AV INTERSECTS
2016 Vacant
2019 P & G Building 348-0530
ROOMS
309 State Dept Health (Hlth Stats)
348-9100
State Dept Health (Hlth Plng)
348-0530
JEFFERSON INTERSECTS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1987

2100 State Insurance Comn 348-3386
2101 Department Of Commerce 348-2200
MICHIGAN AV INTERSECTS
2200 Magnet Bank (Br Ofc) 347-6200
2203 Apartments
7 Jones Evergreen 344-9459
8 Jacquet Jeffrey L 344-9440
9 Spears Harold R
2203½ Apartments
A★Fontaine Karen S
B Mc Fadden Dannel
C Smith Willie E
D Thomas Kathleen Mrs 346-0098
2205 Audiology & Hearing Aid Services Inc 345-8522
2206 West Virginia School Board Association 346-0571
2207 Okes Lona M Mrs ◎ 343-0085
2208 Vacant
2209 Apartments
A Austin Estella M 343-5977
B Glynn Eleanor C Mrs 346-7317
C★Malefski Vicki
D Vacant
E Vacant
2209½ Loudermilk Harry E 346-3074
2210 Cassis Rachel S Mrs ◎ 343-9155
2211 Tolbert Michl E ◎ 346-9515
2212 Stover Jas D 342-7462
2213 Apartments
A Vacant
2214 Wilson Nancy R ◎ 343-1501
2215 Apartments
A Vacant
B Vacant
C Payne Steve 343-5416
D Pressler Pamela A
E Vacant
2217a★Armstead Tim P 342-1524
2217b Willis Lisa 343-6001
2218★Thornhill Audra T 342-0739
2219 Vacant
2220 Sizemore Ellis B Jr ◎ 342-4425
2221 Vacant
2222★Tyler Wm D ◎ 345-8919
2223 Vacant
2224 Vacant
2225 Vacant
2226a No Return
2228 Drasnin Apartments
A Vacant
B Vacant
C No Return
D No Return
VEAZEY INTERSECTS
2301 Apartments
1 Dirito Jeff 345-8255
2 No Return
3★Lotts Rebecca S 346-1509
4 Vacant

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1983

JEFFERSON ST —FROM 2010 QUARRIER NORTH 1 EAST OF CALIFORNIA AV

ZIP CODE 25311
WASHINGTON INTERSECTS

303★Holstein Patricia © 344-0540
305★Parrish Paul E 346-0610
307 State Dept Welfare (Training) 348-8834
310 No Return
311 Charleston Light Opera Guild Workshop 342-9312
Charleston Children's Theatre Workshop 293-9312
312 Harris Doretha Mrs © 344-3889
313 Vacant

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1983



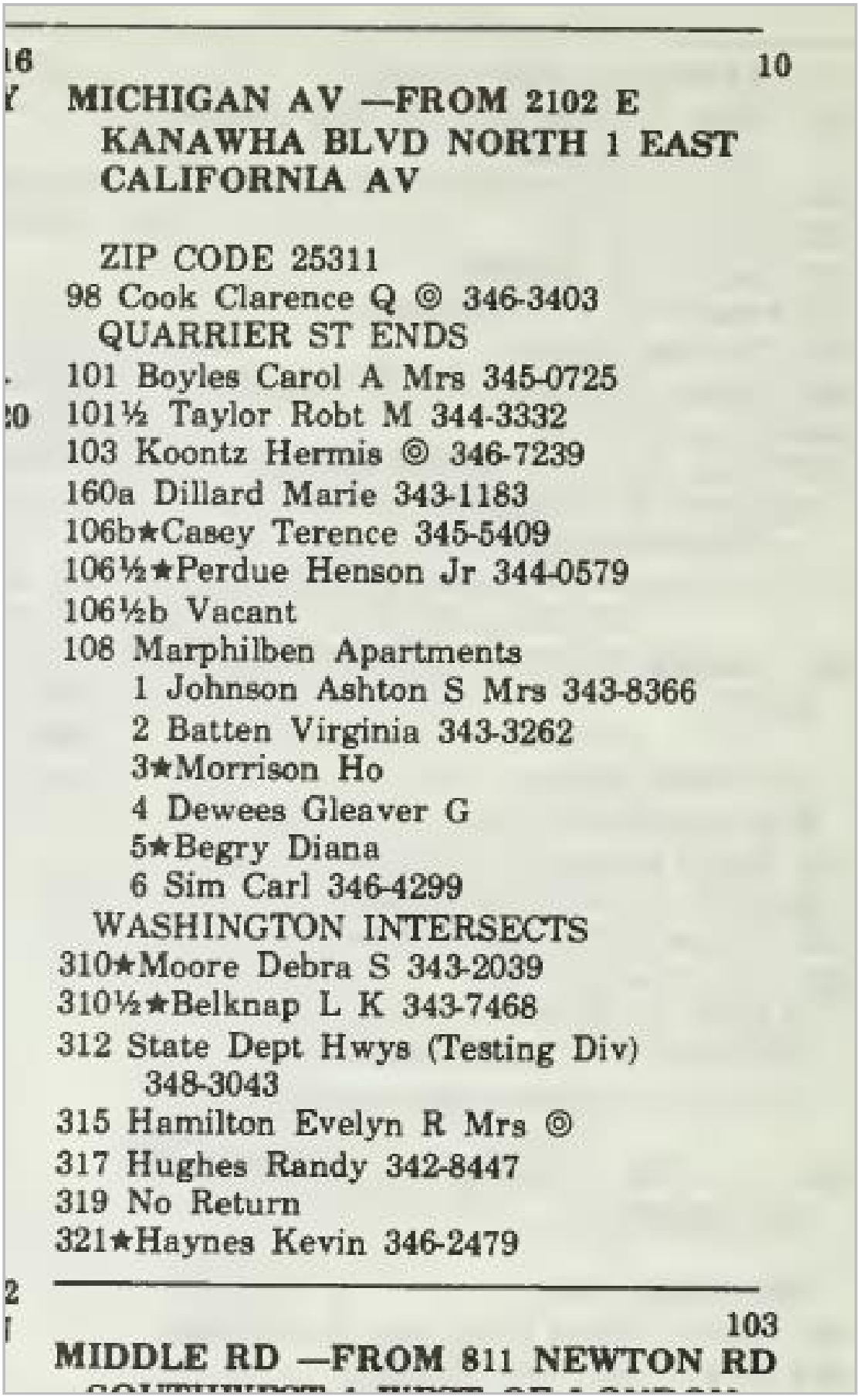
22 314 Shoemaker Kathleen C Mrs ©
342-0007
315★Hostutler Judy 344-0712
317a Skidmore Carolyn Mrs 343-6293
317b Black Kathy A 346-7133
317c★Patel Thakor 346-8726
318 Shawver Lillian P Mrs 343-0847
319a Harris L E
319b Anderson Wiletta

37

JEFFERSON ST (SOUTH
CHARLESTON)—FROM

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1983



16 10

MICHIGAN AV —FROM 2102 E KANAWHA BLVD NORTH 1 EAST CALIFORNIA AV

ZIP CODE 25311

98 Cook Clarence Q ◎ 346-3403

QUARRIER ST ENDS

101 Boyles Carol A Mrs 345-0725

101½ Taylor Robt M 344-3332

103 Koontz Hermis ◎ 346-7239

160a Dillard Marie 343-1183

106b★Casey Terence 345-5409

106½★Perdue Henson Jr 344-0579

106½b Vacant

108 Marphilben Apartments

1 Johnson Ashton S Mrs 343-8366

2 Batten Virginia 343-3262

3★Morrison Ho

4 Dewees Gleaver G

5★Begry Diana

6 Sim Carl 346-4299

WASHINGTON INTERSECTS

310★Moore Debra S 343-2039

310½★Belknap L K 343-7468

312 State Dept Hwys (Testing Div) 348-3043

315 Hamilton Evelyn R Mrs ◎

317 Hughes Randy 342-8447

319 No Return

321★Haynes Kevin 346-2479

103

MIDDLE RD —FROM 811 NEWTON RD

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1983

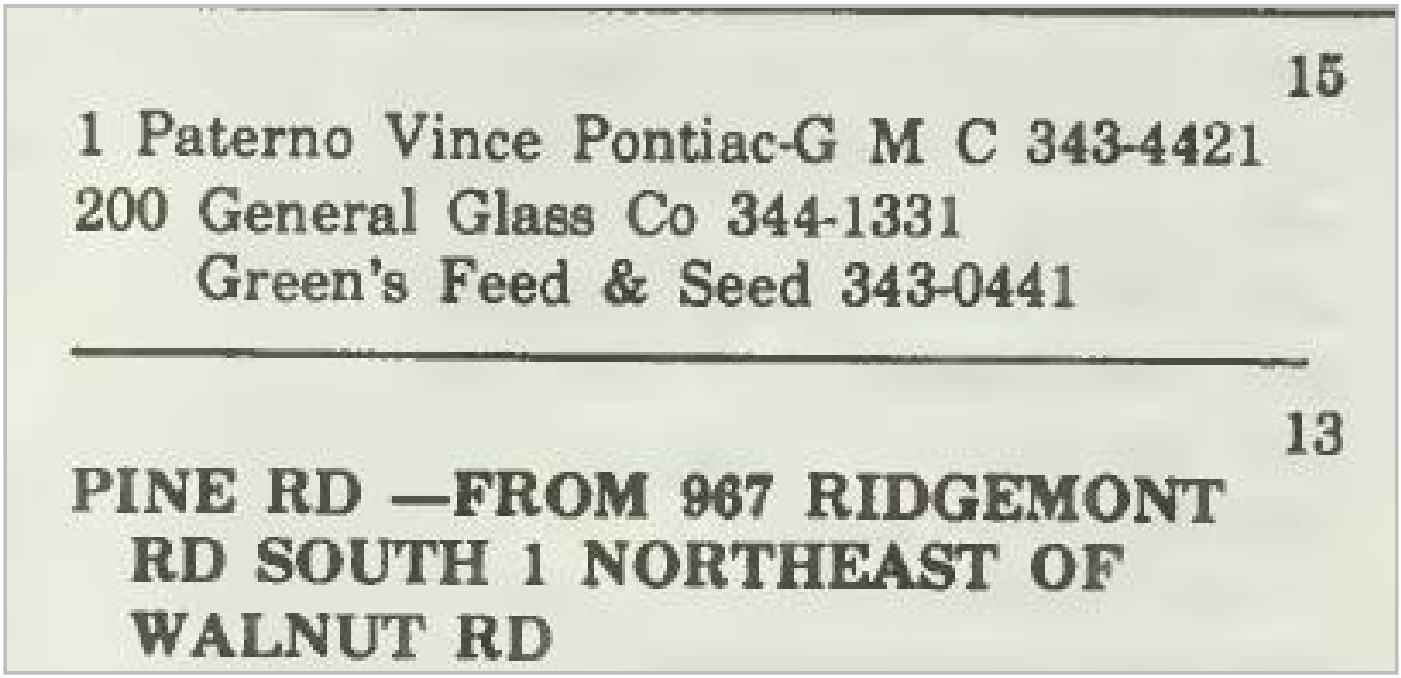
PIEDMONT RD —FROM END OF CAPITOL ST SOUTHEAST 2 NORTH OF SMITH

ZIP CODE 25301
BROAD ENDS
S MAIN DR BEGINS
BROOKS ENDS
MORRIS ENDS
FARNSWORTH DR BEGINS
CHILTON ENDS
ZIP CODE 25311

1511a Kimberling Justice ◎ 343-9189
1511b Bowles Bessie 343-5375
1513 Holbrook John B ◎ 342-1859
1515 Phillips Ruth M Mrs
CARTE ST ENDS
1519 Shanholtzer Karl V ◎ 342-7388
1521 Gore Wilbur C ◎
1523 Gore Vickie Mrs 342-7414
1525 Vacant
1527 Vacant
1531 Stafford Wm E ◎ 342-5392
1533 Mitchell Geo H ◎ 342-4973
1537 Vacant
1537a Abnathy Rosetta M Mrs 346-8192
1539 Williams Bettie L 344-2015
THOMPSON ENDS
1541★Jones Effie
1543 Hopkins Frank E ◎ 342-5615
1545 Page Billy ◎
STADIUM PL INTERSECTS
1547 Penn Jarnice T Mrs ◎ 346-1455
1549 Laidley Field park
ELIZABETH INTERSECTS
CAROLINE ENDS
GREENBRIER INTERSECTS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1983



15

1 Paterno Vince Pontiac-G M C 343-4421
200 General Glass Co 344-1331
Green's Feed & Seed 343-0441

13

PINE RD —FROM 967 RIDGEMONT RD SOUTH 1 NORTHEAST OF WALNUT RD

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1983

Dvlpmnt) 348-2437
CALIFORNIA AV INTERSECTS
2016 Vacant
2017 Vacant
2018★Roach Jerry
2019 P & G Building
ROOMS
1 State Dept Health (Tuberculosis Control) 348-3669
2 State Dept Health (Foster Grandparent Program) 348-0538
3 State Dept Health (Certificate Of Need Ofc) 348-0534
State Dept Health (Health Plng & Evaluation) 348-0530
2020 Workman Debra L 345-6849
2022 Lockhart Arenal 346-9551
JEFFERSON INTERSECTS
2100 State Bd Risk & Ins Mgmnt 348-2291
State Insurance Comn 348-3386
2101 West Virginia Contractors Assn 342-1166
West Virginia Auto & Truck Dlrs Assn 343-4158
Ray Resources 344-4666
MICHIGAN AV INTERSECTS
2200 Pauley Battery Co 344-4391
2203 Beattie & Firth Apartments
7 Williams Sarah W Mrs 344-1946
8 Vacant
9 Spears Barbara A Mrs
2203½ Apartments
A Vacant
B Thomas Kathleen Mrs 346-0098
C Whiting Lena M Mrs 345-2892
2205 Christian Alliance Church 343-5410
2206★Cleage Saunders S
2207 Okes Donald E ◎ 343-0085
2208 No Return
2209 Apartments
A Austin Stelle 343-5977
B Glynn Eleanor C Mrs 346-7317
C★Thompson Gary
D Funk Rexford W 342-8652
E★Bowe Debra 345-5944
2209½ Vacant
2210 Cassis Rachel S Mrs ◎ 343-9155
2211 Tolbert Michl E ◎ 346-9515
2212★Lee Richd S 342-0299
2213 Apartments
A★Bowe A R
B Curtis Randy C 342-8337
C Deitz Robt T 343-2298
D Igo Kay 345-1287
E Petry Chilton
2214 Wilson Nancy R ◎ 343-1501
2215 Apartments
A Basconi E Wayne 344-8146

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1983

E WASHINGTON ST—Contd

B Lilly Joyce A 343-2006 2
C★Ravichandran M T 344-3178 2
D Seitz Benj F 346-9141 2
E Feeney L M 344-3198 2
2217a Willis Lisa A 346-7043 2
2217b Vacant 2
2218★Tyree Lew 343-2055 2
2219 Vacant 2
2220 Sizemore Ellis B Jr ◎ 342-4425 2
2221★Gaylor Jerry 2
2222 Ridinger Margt Mrs ◎ 342-6727 2
2222½ Lett Virginia S Mrs 346-9348 2
2223 Vacant
2224 Gedel Ernestine L Mrs ◎ 342-6384
2225 Vacant
2226a Taylor Cassey L 345-8046
2226b Vacant
2226c★Null Ronna 345-2415
2226d Vacant
2228 Drasnin Apartments
A★Holly Joyce 346-1066
B Board Minnie 344-8653 2
C Hale Phyllis A 2
D★Cayhaw Eli

VEAZEY INTERSECTS

2300 Slaven Eva Mrs ◎ 344-4164
2301 Apartments
1 Armstrong Thos
2★Hatfield Mary Jane 342-5873
3 No Return
4 Summers Gordon W 364-8294
5★Tygrett Frances 342-5873 2
2302 Freeman Enterprises picture framing 342-3856 2
Freeman Donald G 342-3856 2
2304 Coleman Russell D ◎ 346-8462 2
2306 Boyd Mae Mrs ◎ 343-7323 2
2307a★Hamilton Steve 343-1146 2

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

112★Taylor Jeffery A ◎ 345-5845

701

PIEDMONT RD —A CONTINUATION OF PIEDMONT RD (CHASN)

ZIP CODE 25311

2902 Becks Home Improvements 925-4322
2908★Clark Philip G 925-8362
2908½ Vacant
2910 Townsend T A ◎ 925-9157
2926 Ferris Luvina M Mrs ◎ 925-9504
2930 Meador Phyllis L ◎ 925-9023
2931 Winans Maintenance 925-7049
2931½ Cutlap Don 925-5947
2934 Eplin Paul F ◎ 925-4530
2936 Shaffer Danl 925-7424
KANAWHA BLVD E INTERSECTS
3062 Slimmick Geo Jr ◎ 925-5190

700

PIEDMONT RD (PORT AMHERST) FROM 101 DRY BRANCH DR EAST 1 NORTH OF KANAWHA BLVD

Vacant
3062 Slimick Geo A Jr 925-5190
DRY BRANCH DR BEGINS
3322 State Turnpike Comn 348-3740
State Police 348-3740
3324 Dawson R R Bridge Co (Field Ofc) 925-1163
Dawson Rr Bridge Co (Field Ofc) 925-1163
3332 Johnson Martha
3338 Ash Ralph G ◎ 925-7438
3340 Bostic Robt ◎ 925-7652

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1978

10

JEFFERSON ST —FROM 2010 QUARRIER NORTH 1 EAST OF CALIFORNIA AV

ZIP CODE 25311
WASHINGTON INTERSECTS

303 Coleman Henry T ◎ 344-1417
305★Hall Diania
★Kay Steph
1 State Dept Of Welfare
310 Sleeth O Forrest 344-4650
312 Harris Dorothea Mrs ◎ 346-0051
313 National Furn Co Inc (Whse)
314 Shumaker Kathleen C Mrs ◎ 342-0007
315★Rodgers Neil D
317a★Skidmore Carolyn Mrs 342-8757
317b No Return
317c Sangani Pravin 346-7266
318 Shawver Alton D 343-0847
319a★Bay Ester 343-3023
319b★Vickers Jack
319½ Vacant

37

JEFFERSON ST (SOUTH

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1978

MICHIGAN AV —FROM 2102 E KANAWHA BLVD NORTH 1 EAST CALIFORNIA AV

ZIP CODE 25311

98 Cook Clarence Q ◎ 346-3403
QUARRIER ST ENDS
101 Boyles Carol A Mrs
101½ Vacant
102a★Smith Earline 346-8693
102b★Kemplin John
102c Vacant
103★Mc Daniel C J
106a★Nibert Patricia
106b Hogg David L
106½ Vacant
106½b Walker Jack
108 Marphilben Apartments
1 Johnson Ashton S Mrs 343-8366
2★Baton Virginia
3 Vacant
4 Stone Eliz L Mrs 342-8600
5 Nonleaf Dorothy
6 Crowder Kenneth W 346-7770
WASHINGTON INTERSECTS
310★Marion Myrtle
310½★Kanedey John E
312 State Dept Hwys (Testing Div) 348-3043
315★Ellis M L
317★Burgess Dennis W
319 Vacant
321★Harvey Ronald

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1978

MORRIS ENDS
FARNSWORTH DR BEGINS
CHILTON ENDS
ZIP CODE 25311
1511a Kimberling Justice ◎ 343-9189
1511b Bowles Bessie 343-5375
1513 Holbrook J Benson ◎ 342-1859
1515 Phillips Ruth M Mrs
CARTE ST ENDS
1519 Shanholtzer Karl V ◎ 342-7388
1521 Gore Wilbur C ◎
1523 Gore John C 342-7414
1525★Fortner Dwight ◎ 346-2962
1527★La Clair Leon E 346-7590
1531 Stafford Wm E ◎ 342-5392
1533 Mitchell Geo ◎ 342-4973
1537★Ebberhart Laberna R 344-3195
1537a Abnathy Rosetta M Mrs 346-8912
1539 Williams Bettie L Mrs ◎ 344-2015
THOMPSON ENDS
1541 Womack Mc Kinley ◎
1543 Hopkins Frank E 342-5615
1545 Crecileus Myrtle C Mrs ◎ 346-3118
STADIUM PL INTERSECTS
1547 Penn Jarnice T Mrs ◎ 346-1455
1549 Laidley Field park 346-6751
1591★Vickers James 346-7307
1591a Jones Jerry 342-2890
1591b Pinney Jerome V ◎ 344-3845
ELIZABETH INTERSECTS
CAROLINE ENDS
GREENBRIER INTERSECTS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1978

348-2437
CALIFORNIA AV INTERSECTS
2016 Frank Nell H Mrs ◎
2018 Rutledge Effie W Mrs 342-1826
2019 P & G Building
ROOMS
1 State Beer Commission 348-2126
State Dept Educ (Vocational
Rehabilitation Div) 348-2375
FLOORS
2nd Fl State Voc Rehab Div (Program
Development) 348-2386
2020 Capitol Sweeper Co vacuum clns
342-2436
Campbell Paige T 342-2436
2022 No Return
JEFFERSON INTERSECTS
2100 State Comn On Aging 348-3317
MICHIGAN AV INTERSECTS
2200 Pauley Battery Co 344-4391
2203 Beatty & Firth Apartments
7 Vacant
8★Porter Leeroy
9 Spears Harold R 346-6562
2203½ Apartments
A Vacant
2203½b Vacant
2205 Wendling Herbert L ◎ 343-5418
2206 Raiguel Fredk H ◎ 346-5469
2207 Okes Donald E ◎ 343-0085
2208 Ferguson Actuarial Service Inc
343-7509
2209 Apartments
A★Chapman Geo
B Glynn Eleanor C Mrs 346-7317
C Robbins Max E
D Funk Rexford W
E★Ford Gordon D
2209½ Hingeley James M
2210 Cassis Rachel S Mrs ◎ 343-9155
2211 Tolbert Michl E ◎ 346-9515
2212★Skees Richd T
2213 Apartments
A Simmons Mary K Mrs 344-1515
B Curtis Randy C

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1978

C Deitz Robt T 343-2298
D Kesler America P Mrs 343-5765
E Vacant
2214★Willson David ◎ 344-1230
2215 Apartments
A★Maier W J III
B★Lilly Jim A
C Vacant
D Seitz Benj F 346-9141
E Vacant
2217★Rand Barbara
2218 Cassady Nancy W Mrs ◎ 342-5397
2219 Kirby Grace ◎ 346-4990
2220 Sizemore Ellis B Jr ◎ 342-4425
2221 Vacant
2222★Ridinger Margt Mrs ◎ 342-6727
2222½★Lett Virginia S Mrs 346-9348
2223★Zitloch Pauline Mrs
2224 Gedel Ernestine L Mrs ◎ 342-6384
2225 Atelier Antiques
2226a★Deveraux Philip
2226b Vacant
2226c★Snelling Joan Mrs
2226d Tilton Tom
2228 Drasnin Apartments
A No Return
B★Douglas James 343-9867
C Vacant
D Vacant

VEAZEY INTERSECTS

2301 Apartments
1★Chester Joan
2 Vacant
3★Koffman Lota
4★Summers Gordon 746-8294
5★Turdvidch Kay
2302 Freeman Enterprises picture framing 342-3856

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1977

FURLONG AV BEGINS
MORRELL AV BEGINS

701

PIEDMONT RD —A CONTINUATION OF PIEDMONT RD (CHASN)

ZIP CODE 25311
2902 Becks Home Improvements 925-4322
2908★Stover Troy D
2908½★Townsend P T
2910 Townsend T A ◎ 925-9157
2926 Ferris Joe ◎ 925-9504
2930 Meador Emery T 925-2626
2931 Winans Maintenance 925-7049
2932 Porter Monnie Mrs 925-1421
2934 Eplin Paul F ◎ 925-4530
2936 Shaver Danl
KANAWHA BLVD E INTERSECTS

700

PIEDMONT RD (PORT AMHERST) FROM 101 DRY BRANCH DR EAST 1 NORTH OF KANAWHA BLVD

ZIP CODE 25306
3062 Slimick Geo A Jr 925-5190
DRY BRANCH DR BEGINS
3322 West Virginia State Of Turnpike Comn 348-3740
West Virginia State Police 348-3740
Dawson R R Bridge Co (Field Ofc) 925-1163
3324 Lancaster Lee T ◎ 925-1667
3324a★Davis Carol
3324b★Townsend Delbert
3332 Spradling Wade E ◎ 925-6826
3338 Ash Ralph G ◎ 925-7438
3340 Bostic Robt ◎ 925-7652
3341 State Dept Of Hwys 925-5652
3342 Fisher Charles L ◎ 925-9107
3403 Walker Sollie M ◎ 925-3755
3405 Brooks Carl E ◎ 925-2528
3406 Tucker Roscoe F
3407 Withrow Ruby B Mrs ◎ 925-3014
3408★Morris Darrell
3408½★Perry Eliz
3409 Morris Judith I
3410 No Return
3412 Brown Mary A Mrs ◎ 925-7875

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1973

CITY LIMIT

10

JEFFERSON ST —FROM 2010 QUARRIER NORTH 1 EAST OF CALIFORNIA AV

ZIP CODE 25311
WASHINGTON INTERSECTS

303★Coleman A
305 Crown Forward Insurance Co In Receivership 342-8922
307 Apartments
1 Page Saml 342-0878
2★Beuford Hamp 346-9335
3 Hamilton Shos 344-8987
4★Thompson Clarice 343-2813
5 Vacant
6★Marshall Judy Mrs 343-6835
310 Sleeth O Forrest 344-4650
312 Hill Frank B ◎ 342-2464
313 National Furn Co Inc (Whse)
314 Clark Marguerite R Mrs ◎ 342-8049
315 Wiley Walter V 346-1766
317a★Gay Ann
317b Herndandoz Ramon
317c★Davis Barbara 344-8115
317d Vacant (5 Hses 311d-19(d)
317e Montazzoli John
318 Shawver Alton D 343-0847
319½b Hornick Margt Mrs
319½c★Compton Wm E 344-4853

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1973

10

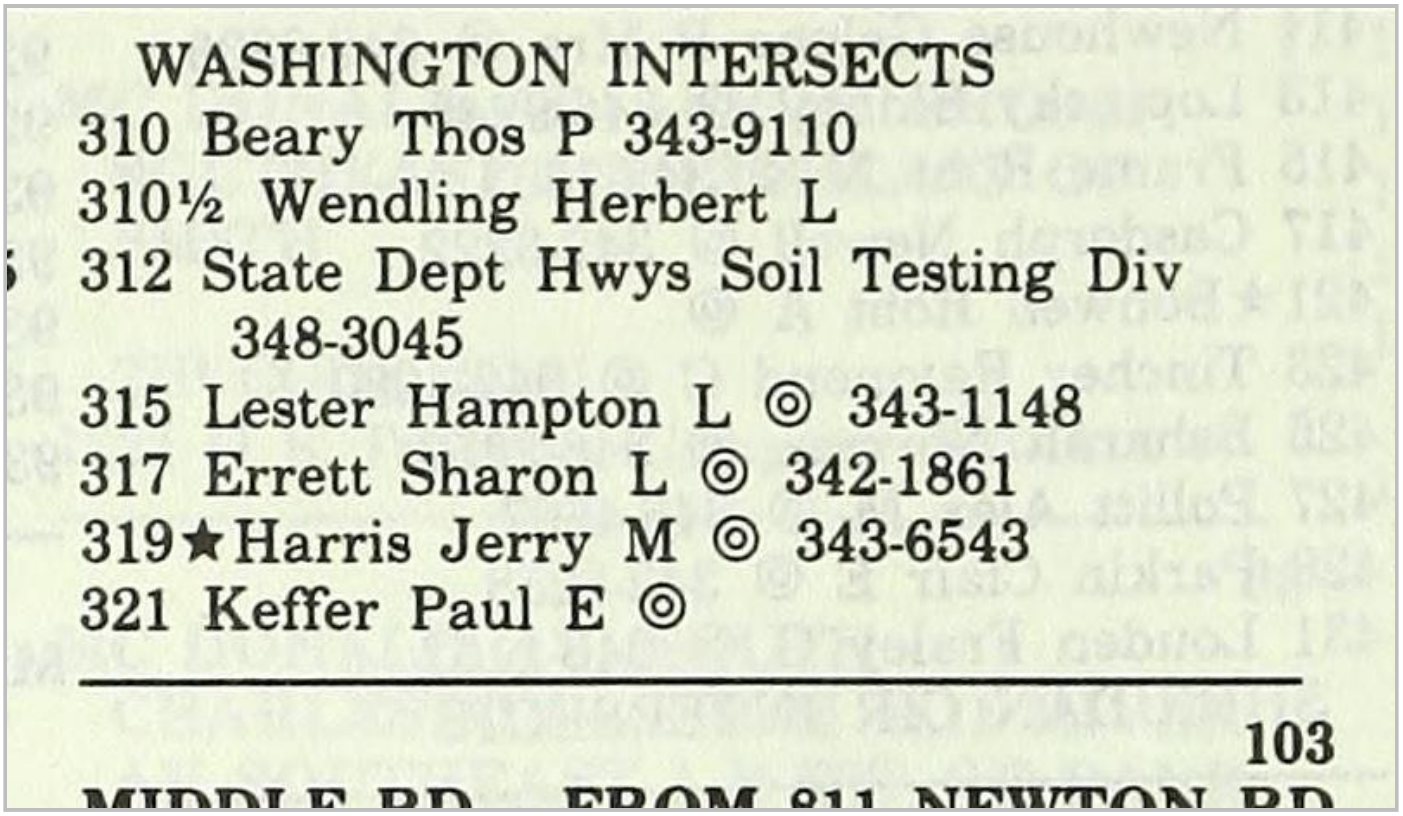
MICHIGAN AV —FROM 2102 E
KANAWHA BLVD NORTH 1 EAST
CALIFORNIA AV

ZIP CODE 25311

98 Cook Clarence Q ◎ 346-3403
QUARRIER ST ENDS
100 Wade Marguerite Mrs 342-0633
100½ Cochran E Howard 343-3098
100½a★Palmer Kathleen Mrs
101 Mc Guire Irene 343-3698
101½ Vacant
102a No Return
102b Kessler John
102c Sloan Hugh D Jr
103 Koontz Hermis D ◎ 346-7239
106a Paris Lynn 343-2994
106b Pierce Margt V Mrs 346-4219
106½ Hindman Buford E 346-9154
106½b Russell Rose Mrs 343-9238
108 Marphilben Apartments
1 Johnson Ashton S Mrs 343-8366
2 Steele Britt S 342-2364
3 Bonham Bertha L Mrs 346-2483
4 Stone Eliz L Mrs 342-8600
5★Gregory Mary
6 Walton Hoy W 343-5050

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1973



WASHINGTON INTERSECTS
310 Beary Thos P 343-9110
310½ Wendling Herbert L
312 State Dept Hwys Soil Testing Div
348-3045
315 Lester Hampton L ◎ 343-1148
317 Errett Sharon L ◎ 342-1861
319★Harris Jerry M ◎ 343-6543
321 Keffer Paul E ◎

103

MIDDLE RD FROM 811 NEWTON RD

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1973

PIEDMONT RD —FROM END OF CAPITOL ST SOUTHEAST 2 NORTH OF SMITH

ZIP CODE 25301
811 Vacant (4 Hses 811-23)
BROAD ENDS
1009 C N S Chemical Co Inc 342-1053
1015 Vacant
S MAIN DR BEGINS
1019 Steel Erectors Inc Shop 346-3875
BROOKS ENDS
1102 Vacant
1105 Gardner Joe ◎ 342-4886
1109 Green Matilda Mrs 346-6614
1115 No Return
1121 Vacant
MORRIS ENDS
1207★Vacant (4 Hses 1207-09b)
FARNSWORTH DR BEGINS
CHILTON ENDS
ZIP CODE 25311
1511 Kimberling Justice ◎ 343-9189
Bowles Bessie 343-5375
1513 Vacant
1515 Whitlock Charles W 344-8872
CARTE ST ENDS
1517 Frasier Beatrice L Mrs ◎ 342-3545
Apartments
A★King James A
B★Nichols Clyde
C★Kearsey John
D★Good Ruby
E★Chandler Brenda
F★Goodall Charles
G★Morgan Harry
H★Rand Robt
1519 Shanholtzer Karl V ◎ 342-7388
1521 Gore Wilbur C ◎ 343-5392
1523 Dunlap Lewis C ◎ 343-0729
1525★Carter Harry ◎
1527 Smith Ambrose C ◎ 343-7130
1531 Stafford Wm E ◎ 342-5392
1533 Carpenter Richd L Rev 342-0200
1537a Pannell Paul 346-8192
1537b Hall Lewis
1539★Williams Bettie L Mrs ◎ 344-2015
THOMPSON ENDS
1541 Womack Mc Kinley ◎
1543 Vacant
1545 Crecileus Homer D ◎ 346-3118
STADIUM PL INTERSECTS
1549 Laidley Field park 346-6751
1547 Penn Norris R ◎ 346-1455
1591 Swim James A 346-1276
1591a Jones Gerald 342-2890
1591b Pinney Jerome V 344-3845
ELIZABETH INTERSECTS
1603 Cadle Inez R Mrs ◎ 344-9435
1605 Sackett Apartments
A★Savage James L 342-2508
B★Hanson Linda L Mrs 343-3989
C Limerick James R 343-6706
D Kennedy Arvel 346-2725
1607 Blackshire Virginia G Mrs ◎ 343-0076
CAROLINE ENDS
1705 Vacant (2 Hses 1705-08)
1708 Vacant
GREENBRIER INTERSECTS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1973

Parent Unit)
CALIFORNIA AV INTERSECTS
2016 Frank Nell H Mrs ◎ 342-7947
2016½ Murphy Lola M Mrs 344-8513
2018 Rutledge E M Mrs 342-1826
2019 P & G Building
FLOORS
1st Fl State Beer Commission 348-2126
State Dept Educ (Vocational Rehabilitation Div) 348-2375
2nd Fl State Voc Rehab Div (Overflow
2d Fl W Va State Of State A B C Comn
2020 Capitol Sweeper Co vacuum clns 342-2436
Campbell Paige T 342-2436
2022 Mc Laughlin Iva Mrs 346-8554
JEFFERSON INTERSECTS
2100 Vacant
2105 Central Baptist Church 342-5279
2107 Afl-Cio Appalachian Council (Overflow)
2109 Appalachian Council Afl-Cio 344-8068
A F L-C I O Appalachian Council (job corps project) 344-8069
A F L-C I O Appalachian Council (operation manpower project) 342-4138
MICHIGAN AV INTERSECTS
2200 Pauley Battery Co 344-4391
2203 Beatty & Firth Apartments
7★Walker Dorsey J
8 Vacant
9★Spears Harold R
2203½ Apartments
A★Pauley Ronlad
B Hess B Irene Mrs 342-1324
C★Brown Arlene Mrs
D Clift Ida Mrs 346-4529
2205 Brooks Ina D Mrs ◎ 342-8961
2206 Raiguel Fred H ◎ 346-5469
2207 Okes Donald E ◎ 343-0085
2208 Vacant
2209 Apartments
A Vacant
B Glynn Eleanor B Mrs 346-7317
C Robbins Max E
D Funk Rexford W 342-8652

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1973

E Casto Wm G Jr 344-3339
2210 Cassis Rachel S Mrs ◎ 343-9155
2211 Tolbert Michl E ◎ 346-9515
2212 Bowen Eliz G Mrs ◎ 343-3044
2213 Apartments
A Simmons Mary K Mrs 344-1515
B Mingledorff Geo H III 343-4749
C★Dean Sandra 346-5832
D Kesler America P Mrs 343-5765
E Orcutt Madge Mrs
2214 Marshall Agnes V ◎ 343-3560
2215 Apartments
A Fair Sadie F Mrs 346-9880
B Gallo Anthony V 344-8762
C★Sonu T Martin 346-8518
D Seitz Benj F 346-9141
E★Carter M D 343-2006
2217★Perrine Frances Mrs ◎ 343-6733
2218 Cassady Nancy W Mrs ◎ 342-5397
2219 Kirby Lawrence G ◎ 346-4990
2220 Sizemore Ellis B Jr 342-4425
2221★Berry Charles A 342-1433
2222 Ridinger Margt S Mrs ◎ 342-6727
2222½ Lett Virginia S Mrs ◎ 346-9348
2223 Fabrics For Fun Inc 344-8733
2224 Gedel Ernestine L Mrs ◎ 342-6384
2225 No Return
2226 No Return
2226a★Fox James L
2226b★Lockard Carolyn S
2226c★Donahue Jack
2228 Drasnin Apartments
A Shearer Dean L
B★Petry Chilton N 344-9362
C Williams Steph R 342-0530
D Sharigan Helen E Mrs 346-6590
VEAZEY INTERSECTS
2301 Apartments
1 Board Minnie B Mrs 344-8653
2 Summers Truman D 344-3287
3★Coffman Lota 346-0288
4 Wilson Dollie P Mrs 342-6400
5 Jarrell Kay Mrs 342-0739
2302 Freeman Don 342-3856
2302a Slaven Eva G Mrs ◎ 344-4164
2304 Boley Leancy W ◎ 346-2267

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1972

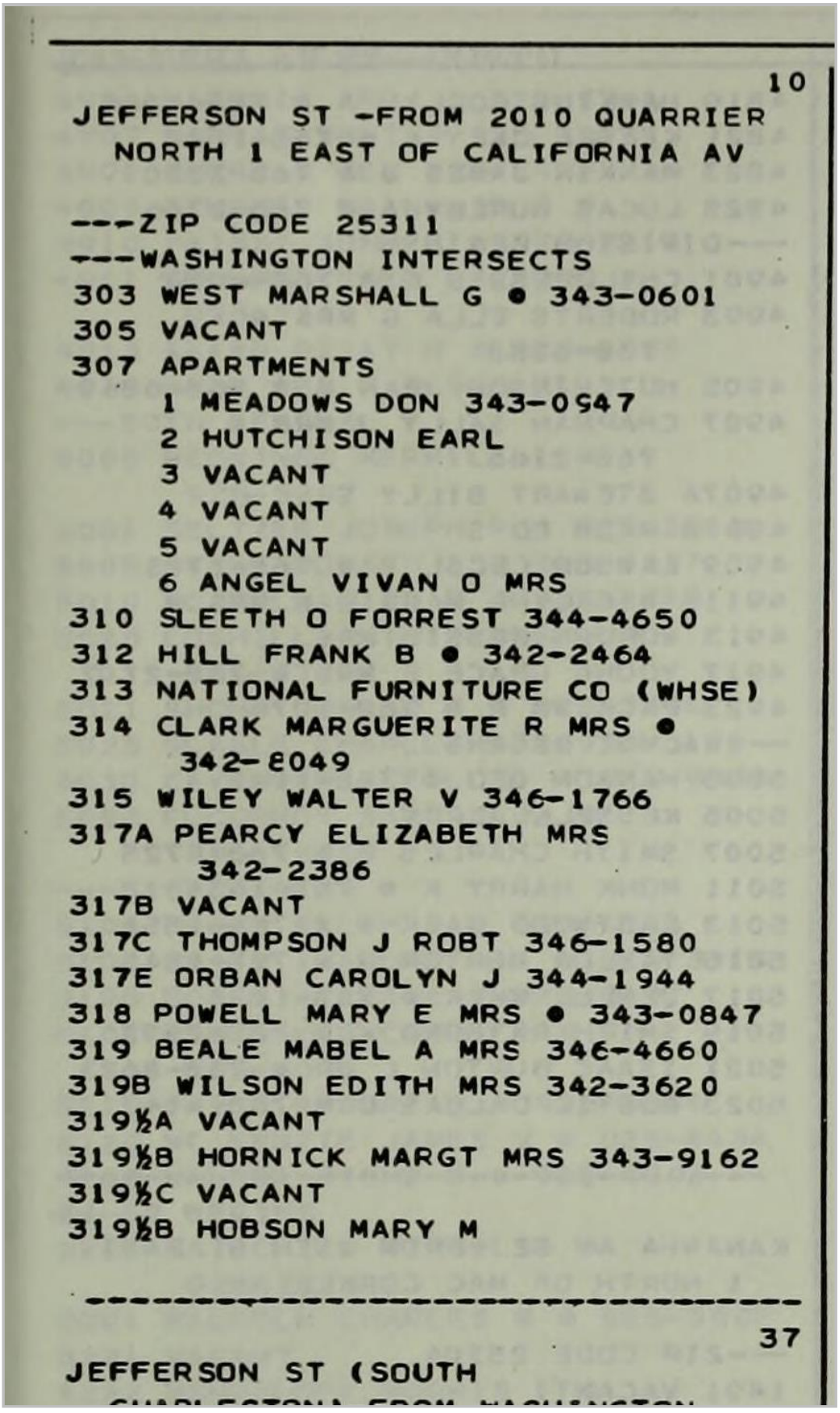
PIEDMONT RD —A CONTINUATION OF PIEDMONT RD (CHASN)

ZIP CODE 25311

2806 Iannarelli Guido ◎ 925-2391
2827 ★ Vacant (2827-63)
2902 Beck's Home Improvements 925-4322
Airlume Eastern Awnings Manufacturers 925-4322
Beck's Raw Iron Center 925-4322
Beck's Venetian Blind & Shade 925-4322
2908½ Townsend Melvin H 925-5283
2908 Townsend John H 925-9372
2910 Townsend T A ◎ 925-9157
2926 Ferris Joe ◎ 925-9504
2930 Meador Giles T ◎ 925-2626
2931 Sherwood Block Inc 925-2683
2932 Porter Monnie Mrs 925-1421
2934 Eplin Paul F ◎ 925-4530
2936 Shaffer Danl C ◎
2950 ★ Asbury Larry justice of peace 925-9052
3002 Smith Guie C ◎ 925-7487
3004 Vaught Sam L 925-5258
Kirby Carol R 925-7590
Bryan Effie R Mrs 925-9082
3008 ★ Bukovinsky Steph ◎
3010 Knight Helen J Mrs ◎ 925-3018
3014 Carter Joseph J ◎ 925-2344
3016 Williams Denzil D 925-9861
3018 ★ Belcher Lawrence R 925-1052
3062 Slimick Geo A Jr 925-5190
3066 Canterbury Lester O ◎ 925-3297
3070 Vacant
Vandall Agatha 925-7683

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1967



10

JEFFERSON ST -FROM 2010 QUARRIER
NORTH 1 EAST OF CALIFORNIA AV

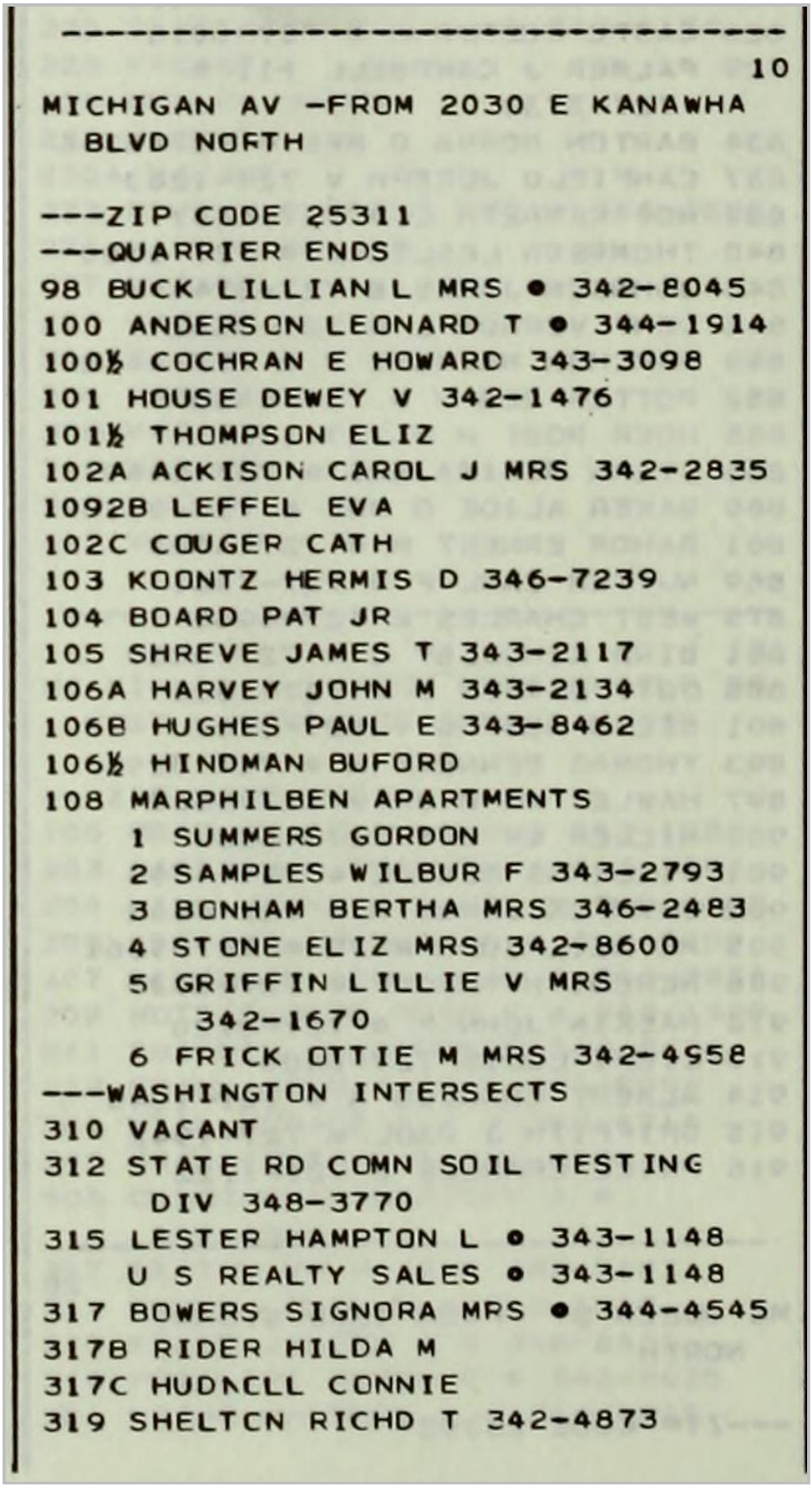
---ZIP CODE 25311
---WASHINGTON INTERSECTS
303 WEST MARSHALL G • 343-0601
305 VACANT
307 APARTMENTS
1 MEADOWS DON 343-0947
2 HUTCHISON EARL
3 VACANT
4 VACANT
5 VACANT
6 ANGEL VIVAN O MRS
310 SLEETH O FORREST 344-4650
312 HILL FRANK B • 342-2464
313 NATIONAL FURNITURE CO (WHSE)
314 CLARK MARGUERITE R MRS •
342-8049
315 WILEY WALTER V 346-1766
317A PEARCY ELIZABETH MRS
342-2386
317B VACANT
317C THOMPSON J ROBT 346-1580
317E ORBAN CAROLYN J 344-1944
318 POWELL MARY E MRS • 343-0847
319 BEALE MABEL A MRS 346-4660
319B WILSON EDITH MRS 342-3620
319½A VACANT
319½B HORNICK MARGT MRS 343-9162
319½C VACANT
319½B HOBSON MARY M

37

JEFFERSON ST (SOUTH

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1967

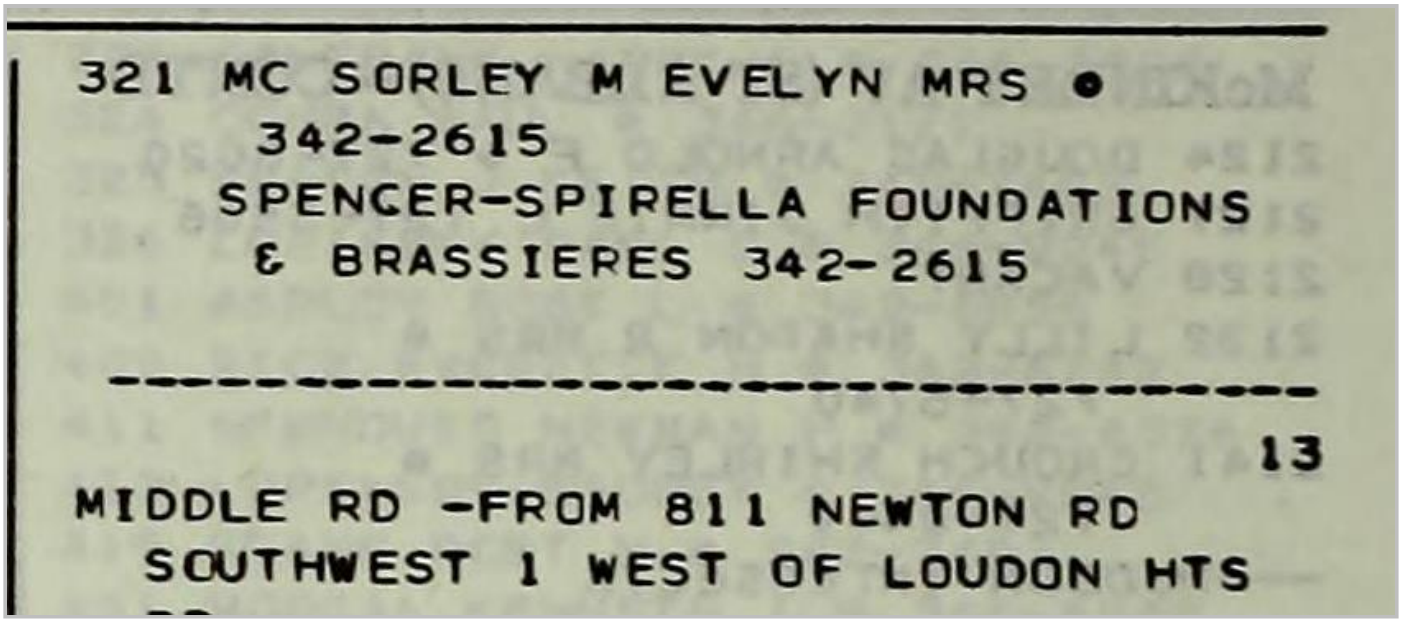


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                                        10
MICHIGAN AV -FROM 2030 E KANAWHA
  BLVD NORTH

---ZIP CODE 25311
---QUARRIER ENDS
98 BUCK LILLIAN L MRS ● 342-8045
100 ANDERSON LEONARD T ● 344-1914
100½ COCHRAN E HOWARD 343-3098
101 HOUSE DEWEY V 342-1476
101½ THOMPSON ELIZ
102A ACKISON CAROL J MRS 342-2835
1092B LEFFEL EVA
102C COUGER CATH
103 KOONTZ HERMIS D 346-7239
104 BOARD PAT JR
105 SHREVE JAMES T 343-2117
106A HARVEY JOHN M 343-2134
106B HUGHES PAUL E 343-8462
106½ HINDMAN BUFORD
108 MARPHILBEN APARTMENTS
    1 SUMMERS GORDON
    2 SAMPLES WILBUR F 343-2793
    3 BONHAM BERTHA MRS 346-2483
    4 STONE ELIZ MRS 342-8600
    5 GRIFFIN LILLIE V MRS
      342-1670
    6 FRICK OTTIE M MRS 342-4958
---WASHINGTON INTERSECTS
310 VACANT
312 STATE RD COMN SOIL TESTING
     DIV 348-3770
315 LESTER HAMPTON L ● 343-1148
    U S REALTY SALES ● 343-1148
317 BOWERS SIGNORA MRS ● 344-4545
317B RIDER HILDA M
317C HUDNELL CONNIE
319 SHELTON RICHD T 342-4873
```

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1967



321 MC SORLEY M EVELYN MRS ●
342-2615
SPENCER-SPIRELLA FOUNDATIONS
& BRASSIERES 342-2615

13

MIDDLE RD -FROM 811 NEWTON RD
SOUTHWEST 1 WEST OF LOUDON HTS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1967

PICCADILLY ST--CONTD

650 VANCE CHARLES L ● 346-8711
652 WAGNER LOY ● 342-8619
656 VACANT
658 TINCHER HOWARD W ● 346-1795
660 YOUNG KERMIT T ● 343-3687

13

PICKENS ST -FROM KANAWHA RIVER SOUTH 1 EAST OF STANDARD ST

---ZIP CODE 25314

7

PIEDMONT RD -FROM END CAPITOL ST SOUTHEAST 2 NORTH OF SMITH

---ZIP CODE 25301
811 MORGAN JOHN L ●
819 NEELY MILLARD C
821 CLAY ALMA S MRS ● 346-5176
821½ VACANT
823 CLAY ANITA 343-2085
---BROAD ENDS
1002 SWANN LOUISE B MRS ● 346-6716
1004 VACANT
1005 VACANT
1006 DAVIS FRANK E ● 343-9329
1007 FISHER MALCOM
JEFFERS HELEN MRS
1009 VACANT
1015 AUTOMOTIVE PARTS CO THE WHOL 343-7621
---S MAIN DR BEGINS
1018 PRATT ROBT L
1019 STEEL ERECTORS INC 346-3875
1025 PIEDMONT SHELL SERVICE 346-1954
1101 WOODS ALBERTA
---BROOKS ENDS
1102 BROWN MARTHA S MRS 342-3750
1103 JULIAN CHARLIE S 344-3209
1104 VACANT
1105 GARDNER JOE P ● 342-4886
1107 VACANT
1108 NO RETURN
1109 GREEN MATILDA
1111 STREETS EUG C
1111½ VACANT
1112 JOHNSON HUSTON
1113 BROWN JAMES
1113½ VACANT
1114 CARTER REBECCA V ● 342-2905
1115 VACANT
1116 THOMAS VIRGINIA MRS
1118 WOOSTER JEROME C ● 346-5693
1120 PRICE DAN D ● 342-5302
1121 WRIGHT NORA 346-5209
1122 TURNER PINKIE MRS
1124 TURNER SALLY MRS
1125 DANIEL MAXINE MRS
1126 SEALS ARCHIE N ● 343-1916
1127 DAVIS WILL
1128 JACKSON ELSIE W MRS ● 346-3903
1130 GILMORE MADGE B MRS ● 342-6645
1132 DICKERSON JULIA A MRS ● 346-2792
---MORRIS ENDS
1203 FERRELL WM A 343-8324
1203½ VACANT
1204 TYLER CARL A ● 346-2815
1204½ TYLER CARL A JR
1205 HALE THOMAS M ● 342-6291
1207 COLES GERTRUDE E MRS ●
1208 EVANS WM H ● 346-5206
1209 MITCHELL G HOWARD ● 342-4973
1209A FLOYD ANISE 342-7018
1211 ABBOTT MARY A MRS ●
1213 VACANT
1215 DE RITO ALFRED A ● 342-3997
1217 KRISTOF ERNEST J 342-4824
1219 DOBBINS MARVIN L 342-0783
1221 GARDNER JOHN M ● 342-1495
1221A LAWHARN FRANK G 342-5558
1221B SONGER I S 343-7390
1223 KIEFER MARGARET V ● 343-5972
1227 JONES LEWIS S REV ● 343-6663
1229A ROMEO THOS J ● 344-2241
1229B WHITTINGTON THOS D 342-0746
---FARNSWORTH DR BEGINS
1231 VACANT
1231A VACANT
1233 HIGGINBOTHAM FRANK G ● 342-5749
1235A JACKSON JAMES A 346-4647
1235B ANTHONY JANET MRS
1235C SMITH KENNETH 346-6651
1237 PRITT GUY
1239A WHITLOCK CHARLES
1239B VACANT
1239C MOORE HAZEL MRS 346-9086
1241 VICKERS FRANCIS R 342-6326
1243 DOUGHTY WILBUR A 342-4070
1245 MATTHEWS DELLA MRS ● 342-3557
1246 ESKINS ROBT C 343-9270
1247 NO RETURN
1248 WALLACE HOMER C ● 342-3529
1249 VANATER JACK ● 346-7895
1250 WHITE MALCOLM R ● 342-5609
1251 VACANT
1252 BYRER WM F ● 343-2000
1253 SUMMERFIELD JAMES
1254 PERRY EVA M ● 346-7515
1256 VACANT
1258 BURRIDGE ARTH J ● 342-6527
1260 COMPTON BOBBY G ● 343-0830
---CHILTON ENDS
---ZIP CODE 25311
1500 VEAZEY DELLA B MRS ● 342-3478
1502 HAIRSTON PAUL R ● 343-1418
1504 KEGLEY JOHN R JR ● 342-0932
1506 GORE WILBERT C 344-3142
1508 MC PHERSON OTIS K 346-8603
1511 KIMBERLING JUSTICE ● 343-9189
1512 CRAMER ESTELLA MRS ● 342-3483
1513 HOLBROOK BESSIE ● 342-3759
---CART ENDS
1514 EPLING KESTER C ● 346-8205
1515 FERREL CHARLES W 342-1894
1516 HASTINGS WM R ● 342-3594
1517 FRASIER BEATRICE L MRS ● 342-3545
1518 VAN DEVENDER ROBT S ● 342-7544
1519 SHANHOLTZER KARL V ● 342-7388
1520 PIERCE SAMUEL H 346-6269
1521 SCHMEICHEL ARTHUR L P ● 343-8122
1522 SWEENEY SARA G MRS ● 342-5335
1523 DUNLAP LEWIS C ● 343-0729
1524 PUGH ELLEN MRS
1525 LINDSEY LEATHA B MRS ● 342-1630
1526 AIELLO ANNA P MRS ● 343-8107
1526½ WOODY BERNARD R
1527 SMITH AMBROSE C ●
1528 ANDERSON LUCY M MRS 344-3855
1530 ROBIE SELLY E ● 346-1783
1531 STAFFORD WILLIAM E ● 342-5392
1532 CURRY WM R 346-5449
1533 VEAZEY LOUIS A ● 343-1180
1534 SUTER APARTMENTS
1 ATKINS JOE 342-4910
2 THOMPSON MINNIE P MRS 346-9224
3 HALL EFFIE L MRS 346-1012
1536 GALLIGAN EDW G ● 343-6386
1537 SAYE GUY O 343-1743
1539 MEADOR JOHN W 343-7402
---THOMPSON ENDS
1540 LEWIS CHARLES R ● 343-9679
1541 VACANT
1542 HILL DENVER H 342-5327
1543 VACANT
1544 STOUT THOS L ●
1545 CRECELIUS HOMER D ● 346-3118
---STADIUM PL INTERSECTS
1546 LAIDLEY FIELD PARK 346-6751
1547 ROSS CHARLES J ● 342-0293
1560 DAVIS JOHN T 343-5469
1566 MILLER PATTY A MRS 342-0669
1570 MOORE ETHEL ● 346-7548
1572 DOTSON KERMIT H 346-1334
1576 SAUNDERS J CLAUDE ● 343-5257
1578 TRAUX ELOISE R MRS 343-9283
1580 BADGETT J M JR ● 342-5284
1582 DOBSON COVINGTON ● 342-5342
1584 WHITLEY WM R 346-7910
1586 OWENS JOAN MRS 342-4860
1588 HICKS ALONZO S ● 344-2073
1590 TYREE JOHN S ● 342-0594
1591 SWIM JAMES A 346-1276
1591A FRIST ROY 346-0049
1591B PINNEY JEROME V 343-8489
1592 RAYFORD GEO B ● 343-1306
1594 BAYS BERT A ● 342-2795
1596 RICHARDSON TOMMY 342-5612
1598 PARKER NELSON
1598½ WARNER BELLE MRS
---ELIZABETH INTERSECTS
1600 NO RETURN
1602 JARRETT JAMES R ● 342-5718
1603 BOWYER JOANN 344-3987
1604A HAWKIN CATHERINE MARIE
1604B BRIELLE DON
1604C EVANS RAY
1604D BOWDER FREDA
1604E O'BRIEN DAVE
1605 SACKETT APARTMENTS
A CAVENDER WALTER
B SAVAGE JAMES L
C PARKS THOM H
D RICHARDSON BILL L
1606 WILLIAMS BUSTER L JR 342-2975
1607 BLACKSHIRE VIRGINIA G MRS ● 343-0076
1608 VACANT
1608½ VACANT
1609 VACANT
1610 FULKS NATHANIEL S ● 342-2266
1612 MACE PAT MRS
1614 WAUGH MESHACH ● 342-2348
1699 MYLES JAMES N 346-4825
1699½ VACANT
---CAROLINA ENDS
1700 FLEMING DOUGLAS ● 346-7980
1702 SAINT CLAIR HARRY B ● 342-3605
1704 WALKER JAMES ● 346-6193
1705 GAMMON WM ● 342-3962
TABOR MUSIC CO COIN OPERATED MACHS 342-3962
1706 CHANDLER MARIE S MRS ● 344-3833
1707 CRUMS WM
1708 SAINT CLAIR JAMES W ● 343-5379
1709 WALKER MYRTHA MRS ● 346-1523
1709½ WEST ROBT A
1710 COLLINS KATIE H ● 342-1944

MACHINERY Inc

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1967

PIEDMONT RD--CONTD
1713 SPINKS OVID L ● 343-1463
1715 ISNER NORA MRS ● 343-1783
1715B ISNER RICHD L 346-1109
---GREENBRIER INTERSECTS
1806 TUCKER WM ● 346-8009
1812 ROCHE RAYMOND J ● 342-3412
1814 NICHOLS CARL ● 342-3613
1816 PITTS GLADYS R ● 342-1664
1818 MOSS SHIRLEY E ● 342-1465
1822 HANNA VERNON V ● 342-2262
HANNA PLUMBING CO 342-2262
1826 KEADLE EVERETT E ● 342-2316
---ONEY ENDS
1908 SEAY WM L
1910 VACANT
1912 SHAVER EARL W ● 342-1060
MILAM MARBRA M MRS NURSE
1918 PETERS WM H ● 346-8573
---CALIFORNIA AV ENDS
2000 SMITH A R ● 342-2980
2002 UNDERWOOD EVA G ● 346-8150
2004 KEADLE JAMES M ● 343-6344
2006 MILLER JOSEPH H ● 342-4012
2008 LOWEN TENNELL M ● 344-4147
---JEFFERSON ENDS
2316 SWITZER RAYMOND R 343-9647
2320 KERSEY JAMES W ● 343-7346
2324 BROWN HERBERT J ● 342-1876
---CHESAPEAKE AV ENDS
2516A VACANT
2516B WALKER JOSEPH E 344-4539
2520 KIDD ERMA 343-8209
2522 APARTMENTS
1 BARWELL HARRY
2 VACANT
3 HUNT MELVIN
2524 CADLE OWENS 343-1713
2532 SIMMONS MERCELLUS S ●
343-5395
2534 VACANT
2536 FRIDLEY TRESSIE MRS
2536½ BYRD EARL D
TANNER BILLIE
2538 EAST END SUPER MARKET
346-1141
2538½ VACANT
2540 PARADISE TAVERN 342-9131
2540½ CRUCH SHIRLEY
2542 EAST END TAVERN RESTR
342-9871
2542½ VACANT
2548 EAST END FRUIT MARKET
2550 PIEDMONT ROAD HOLINESS
CHURCH OF JESUS CHRIST
---WERTZ AV BEGINS
2600 DICKSON MURRAY ● 342-4507
2600½ EBBERHART LA VERNA MRS
344-3195
2602 LAWRENCE PAUL
2604 HARRIS CHARLES ●
2608 HARRIS NATHAN ● 346-3560
2610 PROCTOR DONALD
2612 O'HALLORAN THOS A ● 346-6792
2614 HENDERSON GEO 343-7029
2615 VACANT
2616 VACANT
2776 GUNNO HAROLD ●
2780 WILEY G W ● 925-9184
2802 THOMAS RAY ● 925-7596
2806 IANNARELLI GUIDO ● 925-2391
---CITY LIMITS
2823 VACANT
2827 CRAIGO JOHN JR 925-3842
2831 GROAH IDA M MRS ● 925-2418
2841 CROSS PUMP & EQUIPMENT CO
INC 925-5822
2843 CARROLL EQUIPMENT CO OILS
925-1771
2845 COMMERCIAL LUBRICANTS CO
925-7809
2855 MACHINERY INC CONTRS SUPS
925-4741
2856 VACANT
2861 SAMMS WM H
2863 PATTERSON JAMES L 925-1563
2865 STAR ROOFING 925-4251
2873 RIVERVIEW LUMBER CO 925-4251
2874 TOPS-ALL TERMITE CONTROL
925-3770
2875 MC DOWELL WALDER D ●
925-7517
2877 LITTON ROMIE ● 925-3803
2877½ MORRIS ROY 925-1731
2878 WEST VIRGINIA WATER TESTING
SERVICE (PLANT) 825-4251
2879 BELCHER CALLAS ● 925-1833
2880 VACANT
2881 GRESHAM PRINTING INC
925-2249
2885 GRESHAM RICHD O ●
2902 BECK'S HOME IMPROVEMENTS INC
925-4322
2929 AMERICAN OIL CO PLANT
925-9051
2931 SHERWOOD BLOCK CO INC
CONCRETE 925-2683

13
PINE RD -FROM 963 RIDGEMONT RD
SOUTH 1 EAST OF OAKMONT RD

---ZIP CODE 25314
908 STINE HAROLD B ● 342-3019
910 FORBES ROBT B ● 346-3706
912 BEARD KENNETH R ● 344-1311
912½ FIELDS BETTY B MRS 342-4458
914 VOORHEES ORPHA N MRS ●
343-6659
915 MORRIS BYRON N ● 343-1417
916 CALLAGHAN DAVID C ● 344-2206
917 ARNETT HOWARD M ● 342-0850
---WALNUT RD INTERSECTS
1005 WORKMAN THOS F 344-2730
1007 HENDERSON JOHN Q
1009 BALDWIN MARVIN A 346-0247

41
PINE ST (DUNBAR)-FROM CHESTNUT ST
NORTHWEST 2 WEST OF ROXALANA RD

---ZIP CODE 25064
101 MIDDLETON TED A ● 768-5522
118 COON RONALD 768-2516
119 PAULEY JAMES H ● 768-4307
120 FACEMYER H F 768-4834
122 WALKER CLETUS R ● 768-5744
125 WALKER ELMER L ● 768-2893
127 HOLLEY JEFFREY R ● 768-6342
HILL JAMES I JR ● 768-3224

38
PINE ST (SOUTH CHARLESTON)-FROM
5126 INDIANA AV SOUTH

---ZIP CODE 25309
704 HARLESS RALPH J JR ● 768-6550
706 SIEMIACZKO STANLEY ● 768-8466
708 GROVES GILMER E ● 768-5610

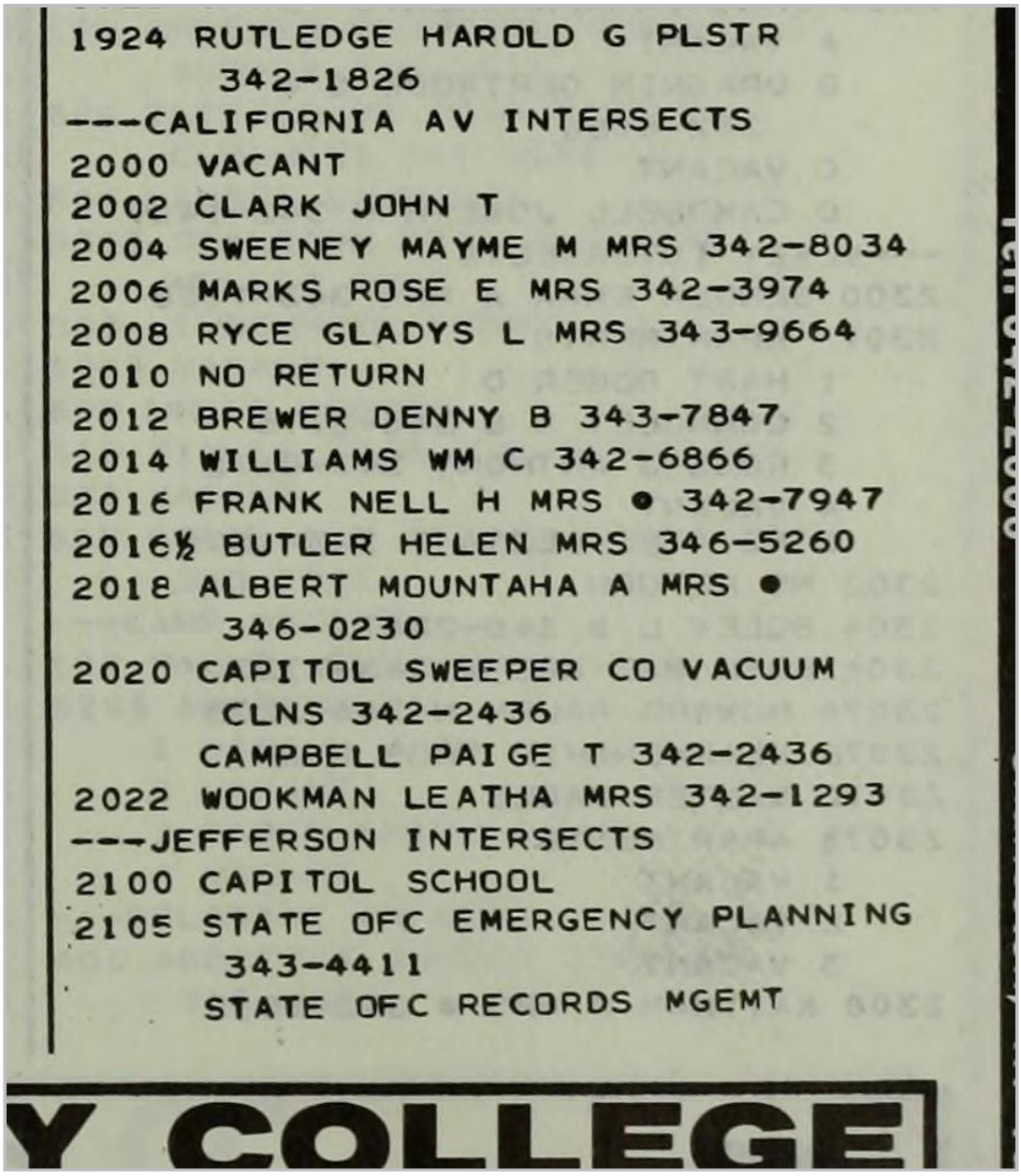
13
PINE HILL RD -FROM LOUDON HTS RD
NORTHWEST 1 SOUTH OF RIDGEVIEW
DR

---ZIP CODE 25314
KEELY WM R 343-8691

MORRIS HARVEY

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1967

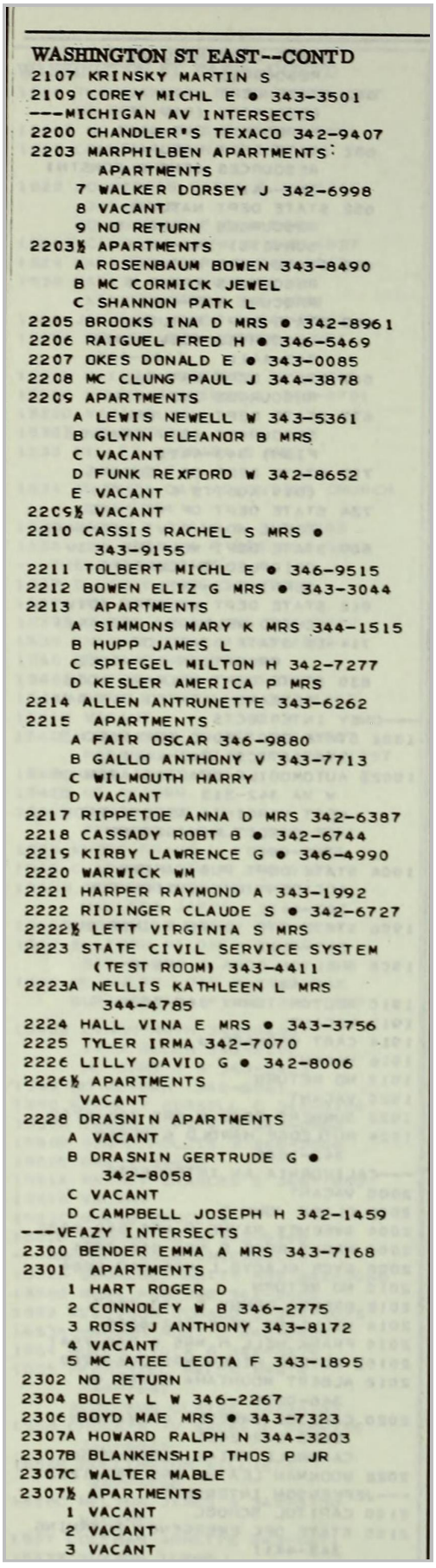


1924 RUTLEDGE HAROLD G PLSTR
342-1826
---CALIFORNIA AV INTERSECTS
2000 VACANT
2002 CLARK JOHN T
2004 SWEENEY MAYME M MRS 342-8034
2006 MARKS ROSE E MRS 342-3974
2008 RYCE GLADYS L MRS 343-9664
2010 NO RETURN
2012 BREWER DENNY B 343-7847
2014 WILLIAMS WM C 342-6866
2016 FRANK NELL H MRS ● 342-7947
2016½ BUTLER HELEN MRS 346-5260
2018 ALBERT MOUNTAHA A MRS ●
346-0230
2020 CAPITOL SWEEPER CO VACUUM
CLNS 342-2436
CAMPBELL PAIGE T 342-2436
2022 WOOKMAN LEATHA MRS 342-1293
---JEFFERSON INTERSECTS
2100 CAPITOL SCHOOL
2105 STATE OFC EMERGENCY PLANNING
343-4411
STATE OFC RECORDS MGEMT

Y COLLEGE

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

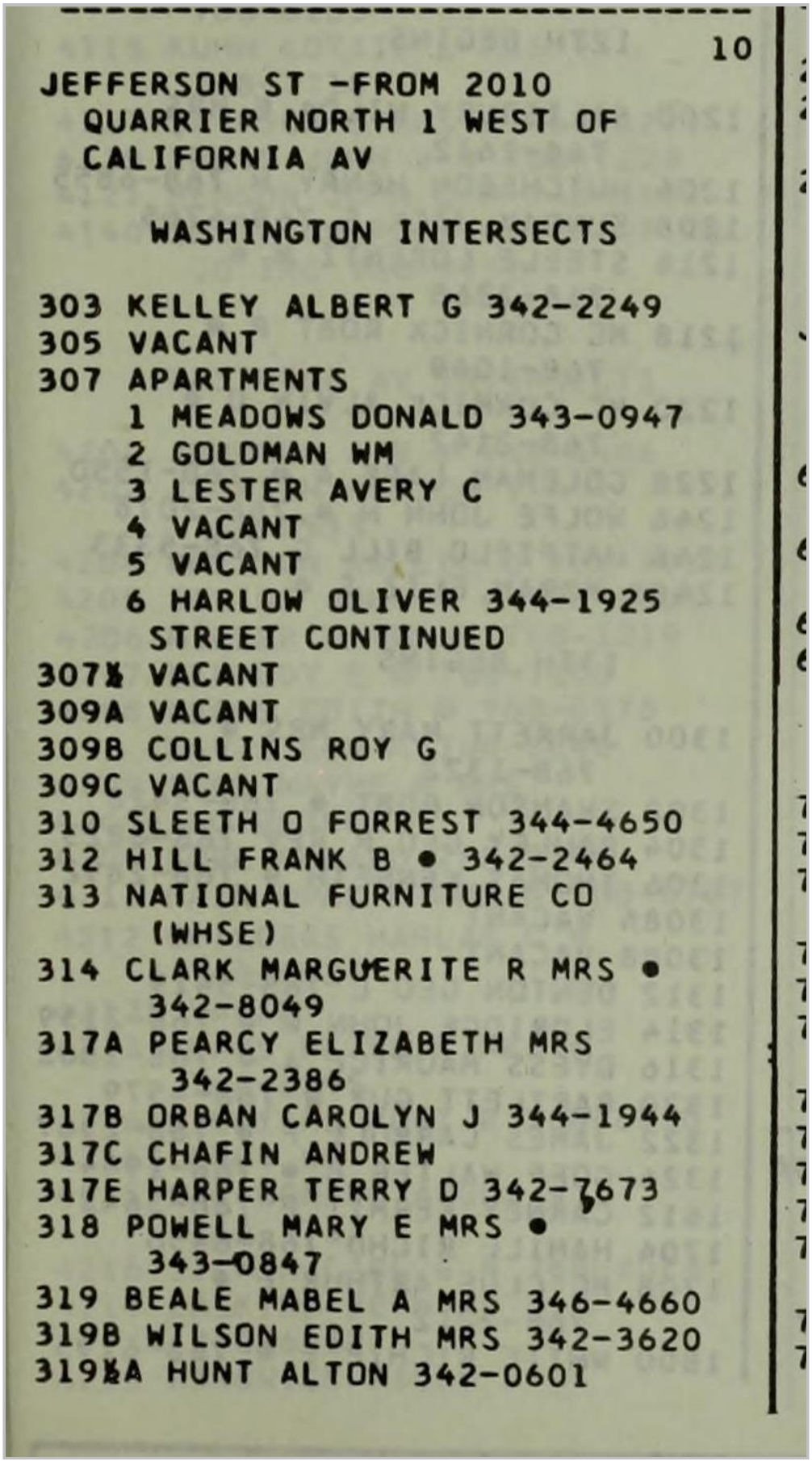
WASHINGTON ST E 1967



WASHINGTON ST EAST--CONTD
2107 KRINSKY MARTIN S
2109 COREY MICHL E • 343-3501
---MICHIGAN AV INTERSECTS
2200 CHANDLER'S TEXACO 342-9407
2203 MARPHILBEN APARTMENTS
APARTMENTS
7 WALKER DORSEY J 342-6998
8 VACANT
9 NO RETURN
2203½ APARTMENTS
A ROSENBAUM BOWEN 343-8490
B MC CORMICK JEWEL
C SHANNON PATK L
2205 BROOKS INA D MRS • 342-8961
2206 RAIGUEL FRED H • 346-5469
2207 OKES DONALD E • 343-0085
2208 MC CLUNG PAUL J 344-3878
2209 APARTMENTS
A LEWIS NEWELL W 343-5361
B GLYNN ELEANOR B MRS
C VACANT
D FUNK REXFORD W 342-8652
E VACANT
2209½ VACANT
2210 CASSIS RACHEL S MRS •
343-9155
2211 TOLBERT MICHL E • 346-9515
2212 BOWEN ELIZ G MRS • 343-3044
2213 APARTMENTS
A SIMMONS MARY K MRS 344-1515
B HUPP JAMES L
C SPIEGEL MILTON H 342-7277
D KESLER AMERICA P MRS
2214 ALLEN ANTRUNETTE 343-6262
2215 APARTMENTS
A FAIR OSCAR 346-9880
B GALLO ANTHONY V 343-7713
C WILMOUTH HARRY
D VACANT
2217 RIPPETOE ANNA D MRS 342-6387
2218 CASSADY ROBT B • 342-6744
2219 KIRBY LAWRENCE G • 346-4990
2220 WARWICK WM
2221 HARPER RAYMOND A 343-1992
2222 RIDINGER CLAUDE S • 342-6727
2222½ LETT VIRGINIA S MRS
2223 STATE CIVIL SERVICE SYSTEM
(TEST ROOM) 343-4411
2223A NELLIS KATHLEEN L MRS
344-4785
2224 HALL VINA E MRS • 343-3756
2225 TYLER IRMA 342-7070
2226 LILLY DAVID G • 342-8006
2226½ APARTMENTS
VACANT
2228 DRASNIN APARTMENTS
A VACANT
B DRASNIN GERTRUDE G •
342-8058
C VACANT
D CAMPBELL JOSEPH H 342-1459
---VEAZY INTERSECTS
2300 BENDER EMMA A MRS 343-7168
2301 APARTMENTS
1 HART ROGER D
2 CONNOLEY W B 346-2775
3 ROSS J ANTHONY 343-8172
4 VACANT
5 MC ATEE LEOTA F 343-1895
2302 NO RETURN
2304 BOLEY L W 346-2267
2306 BOYD MAE MRS • 343-7323
2307A HOWARD RALPH N 344-3203
2307B BLANKENSHIP THOS P JR
2307C WALTER MABLE
2307½ APARTMENTS
1 VACANT
2 VACANT
3 VACANT

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1963



10

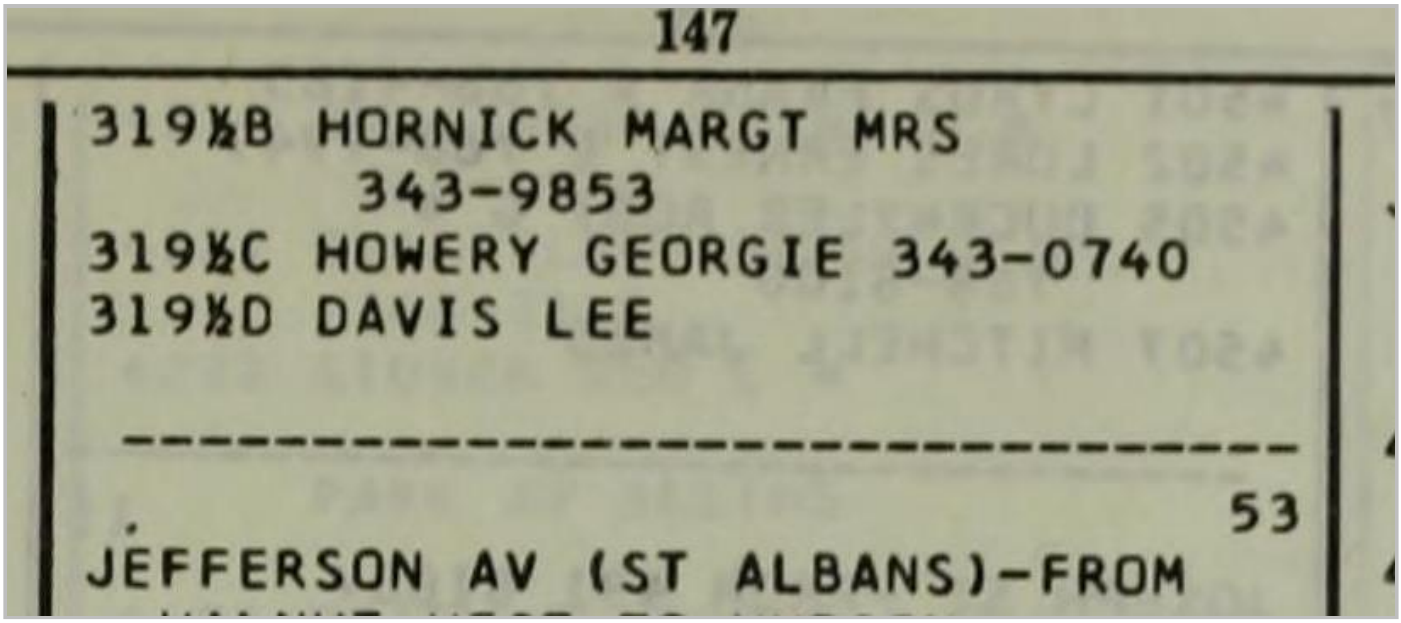
JEFFERSON ST -FROM 2010
QUARRIER NORTH 1 WEST OF
CALIFORNIA AV

WASHINGTON INTERSECTS

303 KELLEY ALBERT G 342-2249
305 VACANT
307 APARTMENTS
1 MEADOWS DONALD 343-0947
2 GOLDMAN WM
3 LESTER AVERY C
4 VACANT
5 VACANT
6 HARLOW OLIVER 344-1925
STREET CONTINUED
307½ VACANT
309A VACANT
309B COLLINS ROY G
309C VACANT
310 SLEETH O FORREST 344-4650
312 HILL FRANK B • 342-2464
313 NATIONAL FURNITURE CO
(WHSE)
314 CLARK MARGUERITE R MRS •
342-8049
317A PEARCY ELIZABETH MRS
342-2386
317B ORBAN CAROLYN J 344-1944
317C CHAFIN ANDREW
317E HARPER TERRY D 342-7673
318 POWELL MARY E MRS •
343-0847
319 BEALE MABEL A MRS 346-4660
319B WILSON EDITH MRS 342-3620
319½A HUNT ALTON 342-0601

Target Street	Cross Street	Source
✓	-	POLK DIRECTORY CO

JEFFERSON ST 1963



147

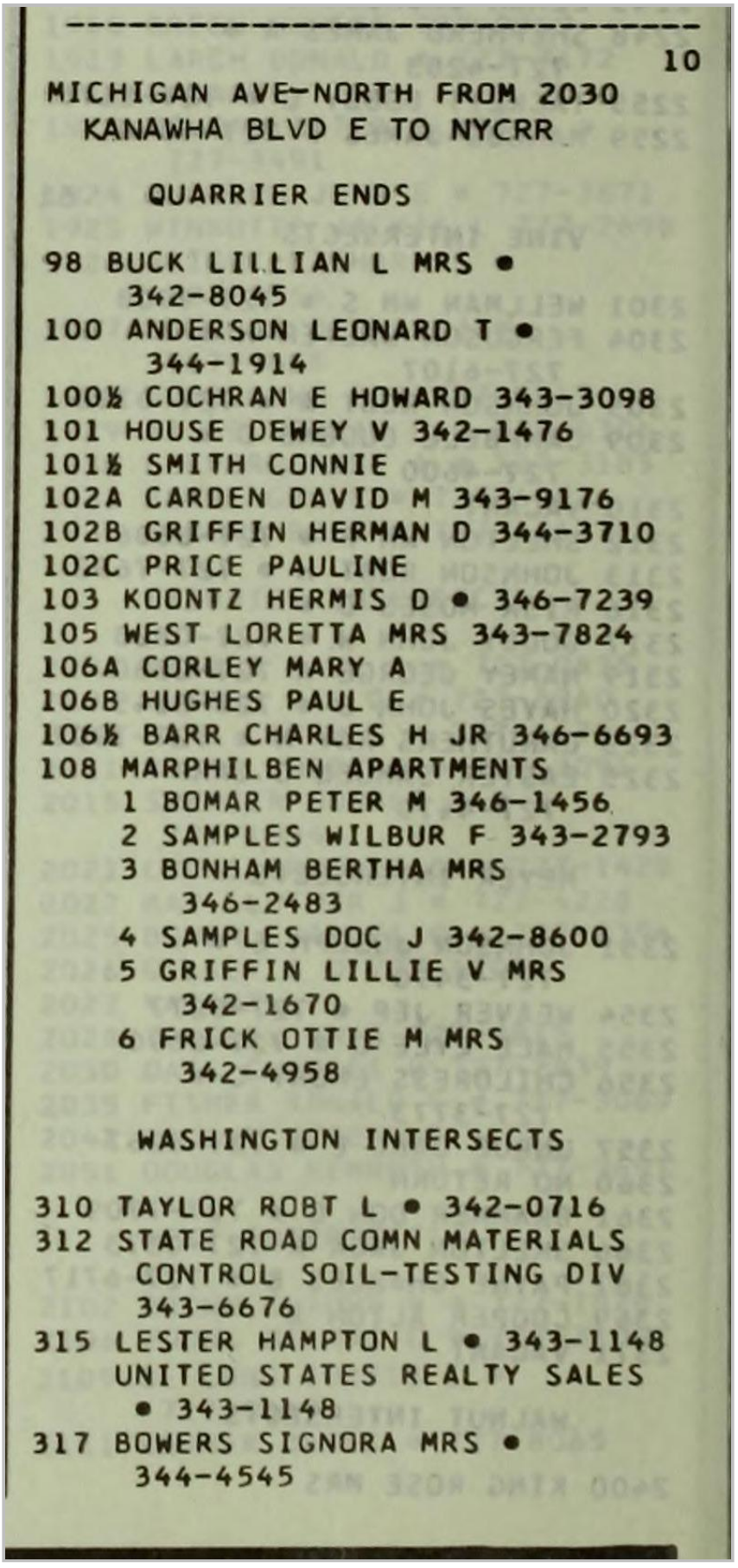
319½B HORNICK MARGT MRS
343-9853
319½C HOWERY GEORGIE 343-0740
319½D DAVIS LEE

53

JEFFERSON AV (ST ALBANS)-FROM

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1963



10

MICHIGAN AVE-NORTH FROM 2030
KANAWHA BLVD E TO NYCRR

QUARRIER ENDS

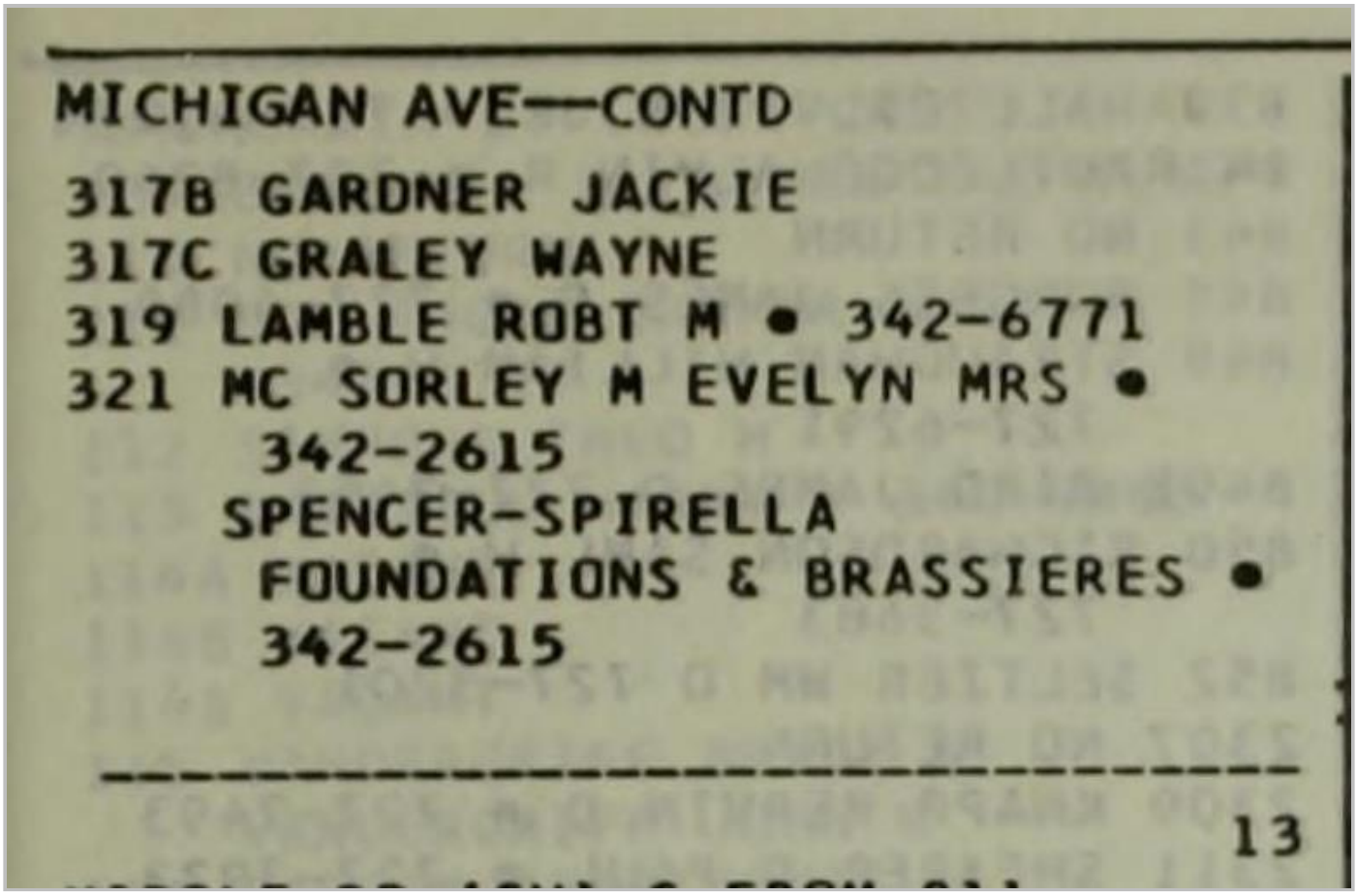
98 BUCK LILLIAN L MRS •
342-8045
100 ANDERSON LEONARD T •
344-1914
100½ COCHRAN E HOWARD 343-3098
101 HOUSE DEWEY V 342-1476
101½ SMITH CONNIE
102A CARDEN DAVID M 343-9176
102B GRIFFIN HERMAN D 344-3710
102C PRICE PAULINE
103 KOONTZ HERMIS D • 346-7239
105 WEST LORETTA MRS 343-7824
106A CORLEY MARY A
106B HUGHES PAUL E
106½ BARR CHARLES H JR 346-6693
108 MARPHILBEN APARTMENTS
1 BOMAR PETER M 346-1456
2 SAMPLES WILBUR F 343-2793
3 BONHAM BERTHA MRS
346-2483
4 SAMPLES DOC J 342-8600
5 GRIFFIN LILLIE V MRS
342-1670
6 FRICK OTTIE M MRS
342-4958

WASHINGTON INTERSECTS

310 TAYLOR ROBT L • 342-0716
312 STATE ROAD COMN MATERIALS
CONTROL SOIL-TESTING DIV
343-6676
315 LESTER HAMPTON L • 343-1148
UNITED STATES REALTY SALES
• 343-1148
317 BOWERS SIGNORA MRS •
344-4545

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

MICHIGAN AVE 1963



MICHIGAN AVE—CONTD

317B GARDNER JACKIE
317C GRALEY WAYNE
319 LAMBLE ROBT M • 342-6771
321 MC SORLEY M EVELYN MRS •
342-2615
SPENCER-SPIRELLA
FOUNDATIONS & BRASSIERES •
342-2615

13

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1963

1511 KIMBERLING JUSTICE •
343-9189
MILLER WM F 343-7066
1512 CRAMER ESTELLA MRS •
342-3483

CART ENDS

1514 EPLING KESTER C • 346-8205
1515 PLANTZ MARY E MRS 343-5479
1516 HASTINGS WM R • 342-3594
1517 FRASIER BEATRICE L MRS •
342-3545
1518 VAN DEVENDER ROBT S •
342-7544
1519 SHANHOLTZER KARL V •
342-7388
1520 PIERCE SAMUEL H 346-6269
1520½ TOLER RUBY MRS
1521 SCHMEICHEL ARTHUR L P •
343-8122
1522 SWEENEY SARA G MRS •
342-5335
1523 DUNLAP LEWIS C • 343-0729
1524 PUGH ELLEN MRS
1525 LINDSEY LEATHA B MRS •
342-1630
1525½ VACANT
1526 AIELLO ANNA P MRS •
1527 SMITH AMBROSE C • 343-7130
1528 ANDERSON LUCY M MRS
1530 ROBIE SELLY E • 346-1783
1531 STAFFORD WILLIAM E •
342-5392
1532 VACANT
1533 VEAZEY LOUIS A • 343-1180
1534 SUTER APARTMENTS
APARTMENTS
1 CRANK CLIFFORD 342-4910
2 THOMPSON MINNIE P MRS
346-9224
3 GILLUM NORMAN 343-8110
STREET CONTINUED
1536 GALLIGAN EDW G • 343-6386
1537 SAYE GUY O •
1539 MMEADOR JOHN W 343-7402

THOMPSON ENDS

1540 LEWIS CHARLES R • 343-9679
1541 NO RETURN
1542 HILL DENVER H 342-5327
1543 NO RETURN

FRANKS DR ENDS
BOWEN BEGINS

1544 VICKERS GLENN C 342-4995
1545 BENTLEY PLUMBING & HEATING
CO 343-1729
CRECELIUS HOMER D •
343-1729

STADIUM PL INTERSECTS

LAIDLEY FIELD PARK
346-6751
1547 ROSS CHARLES J 342-0293
1566 VACANT
1570 MOORE OTHEL • 342-7063
1572 DOTSON KERMIT H 346-1334
1576 SAUNDERS J CLAUDE •
343-5257
1578 TRAUX ELOISE R MRS
343-9283

1580 ASHWORTH WALTER W •
1582 DOBSON COVINGTON •
342-5342
1584 MINNER GEORGE W • 346-1110
1586 BANKS FLORENCE G MRS
343-2354
1588 HICKS ALONZO S 344-2073
1590 TYREE JOHN S • 342-0594
1591 SWIM JAMES A 346-1276
1591A NO RETURN
1591B PINNEY JEROME V 343-8489
1592 RAYFORD GEO B • 343-1306
1594 BAYS BERTRAND A • 342-2795
1596 KIDD MARIETTA L MRS •
342-1912
1598 HELLER CLARENCE E
1598½ ALDERSON CLARA MRS
343-9818

ELIZABETH INTERSECTS

1600 FERGUSON WM E 343-7969
1602 JARRETT JAMES R • 342-5718
1603 NO RETURN
1604A VACANT
1604B CURRY FRIEDA
1604C FARRIGGIO JAMES
1604D CHAMBERS JO ELLEN
344-1046
1604E COLLINS MARTHA 342-4639
1605 SACKETT APARTMENTS
APARTMENTS
A FULKS VIRGINIA P MRS
A FULKS JOHN A
B NIDA JAMES
C VACANT
D TESSISTOR MARY MRS NURSE
STREET CONTINUED
1606 SCRAGG KENNETH W 344-1440
1607 BLACKSHIRE VIRGINIA G MRS
• 343-0076
1608 ROSS RICHD
1608½ NO RETURN
1609 VACANT
1610 FULKS NATHANIEL S(•
342-2266
1612 LEACH OPAL G MRS
1614 WAUGH MESHACH • 342-2348
1698 VACANT
1699 FRIST LAURA MRS • 342-3803
1699½ VACANT

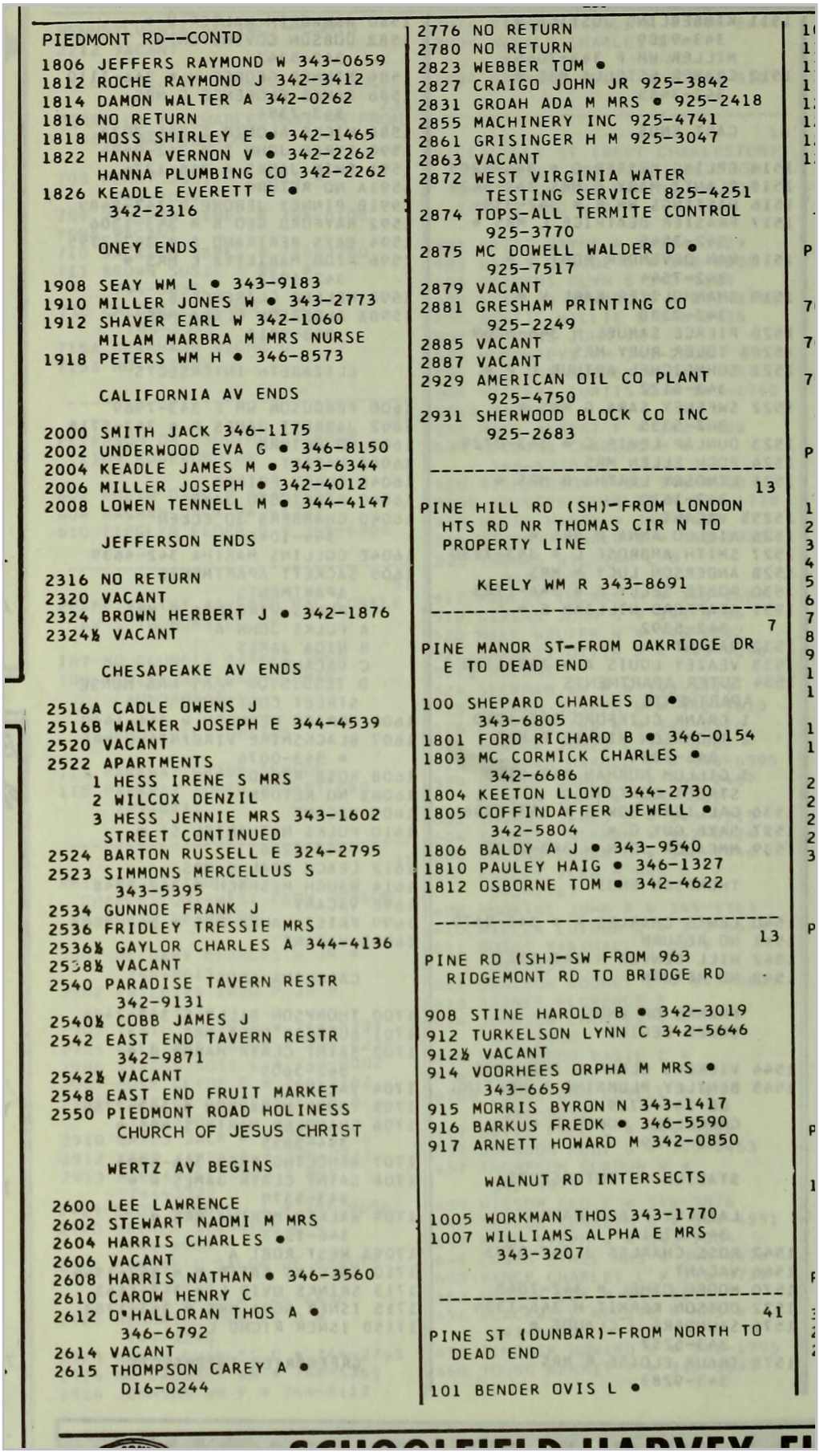
CAROLINA ENDS

1700 THOMPSON BILLY G 343-2498
1701 BURGESS DORA MRS
1702 SAINT CLAIR HARRY B •
342-3605
1704 VACANT
1705 YOUNG H RAYMON • 343-7758
1706 CHANDLER MARIE S MRS •
344-3833
1707 WENDLING FRED 346-6996
1708 SAINT CLAIR JAMES W •
343-5379
1709 WALKER MYRTHA MRS •
346-1523
1709½ WEST ROBT A
1710 COLLINS KATIE H • 342-1944
1713 SPINKS OVID L • 343-1463
1715 ISNER NORA MRS • 343-1783
1715B ISNER RICHD L

GREENBRIER INTERSECTS

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

PIEDMONT RD 1963



PIEDMONT RD--CONTD

1806 JEFFERS RAYMOND W 343-0659
1812 ROCHE RAYMOND J 342-3412
1814 DAMON WALTER A 342-0262
1816 NO RETURN
1818 MOSS SHIRLEY E • 342-1465
1822 HANNA VERNON V • 342-2262
HANNA PLUMBING CO 342-2262
1826 KEADLE EVERETT E • 342-2316

ONEY ENDS

1908 SEAY WM L • 343-9183
1910 MILLER JONES W • 343-2773
1912 SHAVER EARL W 342-1060
MILAM MARBRA M MRS NURSE
1918 PETERS WM H • 346-8573

CALIFORNIA AV ENDS

2000 SMITH JACK 346-1175
2002 UNDERWOOD EVA G • 346-8150
2004 KEADLE JAMES M • 343-6344
2006 MILLER JOSEPH • 342-4012
2008 LOWEN TENNELL M • 344-4147

JEFFERSON ENDS

2316 NO RETURN
2320 VACANT
2324 BROWN HERBERT J • 342-1876
2324½ VACANT

CHESAPEAKE AV ENDS

2516A CADLE OWENS J
2516B WALKER JOSEPH E 344-4539
2520 VACANT
2522 APARTMENTS
1 HESS IRENE S MRS
2 WILCOX DENZIL
3 HESS JENNIE MRS 343-1602
STREET CONTINUED
2524 BARTON RUSSELL E 324-2795
2523 SIMMONS MERCELLUS S 343-5395
2534 GUNNOE FRANK J
2536 FRIDLEY TRESSIE MRS
2536½ GAYLOR CHARLES A 344-4136
2538½ VACANT
2540 PARADISE TAVERN RESTR 342-9131
2540½ COBB JAMES J
2542 EAST END TAVERN RESTR 342-9871
2542½ VACANT
2548 EAST END FRUIT MARKET
2550 PIEDMONT ROAD HOLINESS CHURCH OF JESUS CHRIST

WERTZ AV BEGINS

2600 LEE LAWRENCE
2602 STEWART NAOMI M MRS
2604 HARRIS CHARLES •
2606 VACANT
2608 HARRIS NATHAN • 346-3560
2610 CAROW HENRY C
2612 O'HALLORAN THOS A • 346-6792
2614 VACANT
2615 THOMPSON CAREY A • DI6-0244

2776 NO RETURN
2780 NO RETURN
2823 WEBBER TOM •
2827 CRAIGO JOHN JR 925-3842
2831 GROAH ADA M MRS • 925-2418
2855 MACHINERY INC 925-4741
2861 GRISINGER H M 925-3047
2863 VACANT
2872 WEST VIRGINIA WATER TESTING SERVICE 825-4251
2874 TOPS-ALL TERMITE CONTROL 925-3770
2875 MC DOWELL WALDER D • 925-7517
2879 VACANT
2881 GRESHAM PRINTING CO 925-2249
2885 VACANT
2887 VACANT
2929 AMERICAN OIL CO PLANT 925-4750
2931 SHERWOOD BLOCK CO INC 925-2683

13

PINE HILL RD (SH)-FROM LONDON HTS RD NR THOMAS CIR N TO PROPERTY LINE

KEELY WM R 343-8691

7

PINE MANOR ST-FROM OAKRIDGE DR E TO DEAD END

100 SHEPARD CHARLES D • 343-6805
1801 FORD RICHARD B • 346-0154
1803 MC CORMICK CHARLES • 342-6686
1804 KEETON LLOYD 344-2730
1805 COFFINDAFFER JEWELL • 342-5804
1806 BALDY A J • 343-9540
1810 PAULEY HAIG • 346-1327
1812 OSBORNE TOM • 342-4622

13

PINE RD (SH)-SW FROM 963 RIDGEMONT RD TO BRIDGE RD

908 STINE HAROLD B • 342-3019
912 TURKELSON LYNN C 342-5646
912½ VACANT
914 VOORHEES ORPHA M MRS • 343-6659
915 MORRIS BYRON N 343-1417
916 BARKUS FREDK • 346-5590
917 ARNETT HOWARD M 342-0850

WALNUT RD INTERSECTS

1005 WORKMAN THOS 343-1770
1007 WILLIAMS ALPHA E MRS 343-3207

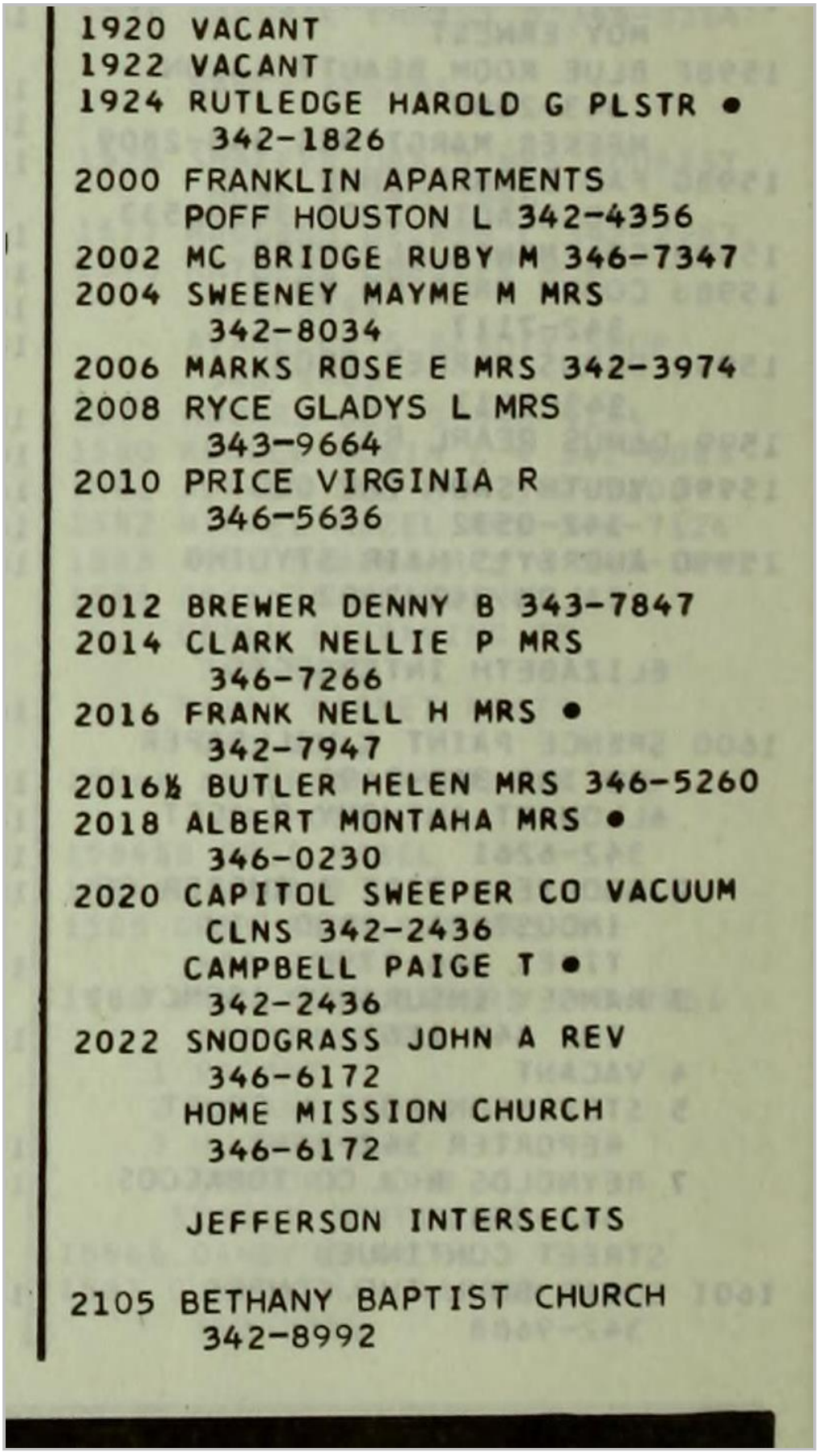
41

PINE ST (DUNBAR)-FROM NORTH TO DEAD END

101 BENDER OVIS L •

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1963



1920 VACANT
1922 VACANT
1924 RUTLEDGE HAROLD G PLSTR •
342-1826
2000 FRANKLIN APARTMENTS
POFF HOUSTON L 342-4356
2002 MC BRIDGE RUBY M 346-7347
2004 SWEENEY MAYME M MRS
342-8034
2006 MARKS ROSE E MRS 342-3974
2008 RYCE GLADYS L MRS
343-9664
2010 PRICE VIRGINIA R
346-5636

2012 BREWER DENNY B 343-7847
2014 CLARK NELLIE P MRS
346-7266
2016 FRANK NELL H MRS •
342-7947
2016½ BUTLER HELEN MRS 346-5260
2018 ALBERT MONTAHA MRS •
346-0230
2020 CAPITOL SWEEPER CO VACUUM
CLNS 342-2436
CAMPBELL PAIGE T •
342-2436
2022 SNODGRASS JOHN A REV
346-6172
HOME MISSION CHURCH
346-6172

JEFFERSON INTERSECTS

2105 BETHANY BAPTIST CHURCH
342-8992

Target Street	Cross Street	Source
-	✓	POLK DIRECTORY CO

WASHINGTON ST E 1963

WASHINGTON ST EAST--CONTD
2107 HESS WM V 346-5194
2109 COREY MICHL E • 343-3501

MICHIGAN AV INTERSECTS

2200 BILL'S ESSO SERVICE
349-2830
2203 MARPHILBEN APARTMENTS
APARTMENTS
7 WALKER DORSEY 342-6998
8 VACANT
9 LAMB PATRICK J 344-2011
STREET CONTINUED
2203½ APARTMENTS
A CLINE HOWARD D
B FERRELL JEAN G 344-1744
C CORDELL ROY
STREET CONTINUED
2205 BROOKS INA D MRS •
342-8961
2206 RAIGUEL FRED H 346-5469
2207 OKES DONALD E • DI3-0085
2208 CUMMINGS B ELIZ MRS
342-5830
2209 APARTMENTS
A LEWIS NEWELL W 343-5361
B WRIGHT MARTIN F JR
346-6432
C CRAWFORD FRANCES N MRS
343-3568
D FUNK REXFORD W 342-8652
E VACANT
STREET CONTINUED
2209½ RINGHAM CHRIS
2210 CASSIS ABR G • 343-9155
2211 TOLBERT MICHL E • 346-9515
2212 BOWEN ELIZ G MRS •
343-3044
2213 PARTMENTS
A SIMMONS MARY K MRS
344-1515
B HUPP JAMES L
C SPIEGEL MILTON H 342-7277
D KISER IRENE M 343-5227
STREET CONTINUED
2214 O'BRIEN MILDRED E MRS •
342-8442
2215 PARTMENTS
A PALMER GORDON L 342-8402
B LUNSTRUM WM E 342-1955
2215 COLEMAN JAMES H 346-6738
D VACANT
STREET CONTINUED
2217 RIPPETOE ANNA D MRS
342-6387
2218 CASSADY ROBT B • 342-6744
2219 KIRBY LAWRENCE G •
346-4990
2220 KLAUER JAMES J 344-4611
2221 VACANT
2222 RIDINGER CLAUDE S •
342-6727
2222½ LETT VIRGINIA S MRS
2224 HALL VINA E MRS • 343-3756
2225 ZAKAIB GROCERY 343-1922
2225A NELLIS KATHLEEN L MRS
344-4785
2225B TYLER IRMA 342-7070
2226 LILLY DAVID G • 342-8006
2226½ APARTMENTS
1 VACANT
2 HELM FREDERICK C
3 CASTO MARION C

2228 DRASNIN APARTMENTS
A KARNASIEWICZ WUAVAMAR L
B DRASNIN GERTRUDE G •
342-8058
C GIBBS EDWARD H 343-5954
D GLYNN JOHN H

VEAZY INTERSECTS

2300 BENDER EMMA A MRS 343-7168
2301 APARTMENTS
1 HUNLEY CHARLES C
2 CONNOLEY W C 346-2775
3 CRUTCHFIELD THOS A
343-8325
4 BOARD MINNIE E 342-0388
5 MC ATEE LEOTA F 343-1895
STREET CONTINUED
2302 MARTIN LEWIS W 346-3490
2304 BOLEY L W 346-2267
2306 BOYD MAE MRS • 343-7323
2307A HOWARD RALPH N 344-3203
2307B YOUNT EVELYN MRS 342-4946
2307C SCRAGG HARDEN
2307½ APARTMENTS
1 MYERS ALICE F
2 VACANT
3 VACANT
STREET CONTINUED
2308 KAY NAN P MRS • 342-6835
2309 LE MASTER DAISY B •
342-4776
2309A QUEEN CLARENCE 346-4528
2309½ STALEN JOHN
2310 VACANT
2311 POLLITT FLORENCE E MRS •
343-0369
2312 CALDERWOOD APARTMENTS
1 ROUSE ANNE N 343-3216
2 HAMILTON LUCILLE E MRS
346-1024
2 HAMILTON KAYE
3 SPURGEON PAUL E DI2-4795
4 MAC NEIL MARION G MRS
346-5723
5 BOUCHARD MARGT S MRS
343-1245
6 VACANT
STREET CONTINUED
2313 APARTMENTS
2 THOMAS JOHN W
3 SMALLEY J W 343-2885
4 MC CLUNG EVELYN 343-2885
STREET CONTINUED
2314 VACANT
2316 ROE GENE R • 343-7911
2317 TRUMAN L M
2317½ BROWN ANNA B 343-8138
2318 CASSIS MOSES L • 346-2136
2319 MAC DERMID NEIL W •
342-7381
2320 BALAZS JOSEPH J • 343-5465
2321 GUTHRIE TOURIST HOME
342-6857
HOOVER EDITH M 342-6857
2322 MEADOWS CECILLE E 342-6936
2324 VANDALE MARGT M MRS
346-1549
2326 BARTON J OTIS • DI6-3584

CHESAPEAKE AV INTERSECTS

2401 TIRE SAVE INC RETREADS NEW
& USED TIRES 346-0005
2402 VACANT

KANAWHA BANKING & TRU

2-002608
WV DIVISION OF HIGHWAYS



id#03902608

STATE OF WEST VIRGINIA
DEPARTMENT OF COMMERCE, LABOR AND ENVIRONMENTAL RESOURCES 7002608
DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION
1356 Hansford Street
Charleston, West Virginia 25301
Telephone (304)348-5929

GASTON CAPERTON
Governor

J. EDWARD HAMRICK III
Director

LARRY W. GEORGE
Deputy Director

NOTICE OF CLOSURE

TO: Underground Storage Tank Owners and/or Operators

FROM: Underground Storage Tank Program
West Virginia Division of Natural Resources
Waste Management Section

DATE OF NOTICE: 3/20/90 EXPIRATION DATE: 5/20/90

This office has received your notice of tank removal and/or closure. Your site has been assigned closure number C-720-90. Please refer to this number on any further correspondence concerning this closure.

If you should have any questions, please call Mark Foley at (304) 348-6371.

Owner/Operator Mailing Address:
Julian W. Ware
WVa. Dept. of Highways
State Capitol Complex
Bldg. 5
Charleston, WV 25305

Location of Excavation:
Materials Division
312 Michigan Ave.
Charleston, WV

Date: 3/23/90

Signed: Jul W. Davis

Comments:
Contact Mark Foley at 348-6371 at least 5 days before beginning work

ID# 2002608

STATE OF WEST VIRGINIA
DEPARTMENT OF COMMERCE, LABOR AND ENVIRONMENTAL RESOURCES
WASTE MANAGEMENT SECTION
1356 Hansford Street
Charleston, West Virginia 25301
Telephone (304) 348-6371

GASTON CAPERTON
Governor

J. EDWARD HAMRICK III
Director

ANN A. SPANER
Deputy Director

NOTICE OF CLOSURE

TO: Underground Storage Tank Owners and/or Operators

FROM: Underground Storage Tank Program
West Virginia Division of Natural Resources
Waste Management Section

DATE OF NOTICE: 5/12/92 EXPIRATION DATE: 7/12/92

This office has received your notice of tank removal and/or closure. Your site has been assigned closure number C-2511 -92. Please refer to this number on any further correspondence concerning this closure. The tank closure is not to begin until 30 days after the date of notice. The site assessment may be performed during those 30 days.

If you should have any questions, please call UST Office at (304) 558-6371.

Owner/Operator Mailing Address:
WV Div of Highways
PO Box 610 - Equipment Div
Buckhannon, WV 26201
Att: Don Post

Location of tanks:
MC 570
312 Michigan Ave
Charleston, WV 25311

Date: 5/15/92
Signed: [signature]

Instructions:
1. Contact UST Office at least 5 days before beginning work.
2. If evidence of contamination if found, it must be reported to the WV DNR District office within 24 hours (See attached page).
3. Copies of site assessments indicating contamination are to be mailed to the appropriate WVDNR district offices. Notification forms are to be mailed to the Charleston office.

Comments: Close /

Revised 1/92

Facility Number
2-002608

STATE OF WEST VIRGINIA
OFFICE OF WASTE MANAGEMENT
UST SECTION

UNDERGROUND STORAGE TANK FACILITY REGISTRATION CERTIFICATE

This certifies that M C S T & D facility
has been duly registered with the State of West Virginia
and that the tank registration fees have been remitted.

Mailing Address: 312 MICHIGAN AVE
CHARLESTON, WV 25311

STATUS: FULL

CERTIFICATE STATUS

This certificate effective July 1, 1992 and expires June 30, 1993.

TO THE CARRIER:THE FACILITY LISTED ABOVE IS IN COMPLIANCE WITH 47-36-4.1 AND 47-37 OF THE UST REGULATIONS AND PRODUCT MAY BE DELIVERED TO THE TANKS LISTED BELOW.

The following tanks have been duly registered at this facility:

Tank Number	Description	Substance Stored
1	6,000 Gal - Removed	

GASTON CAPERTON
Governor

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
Office of the District Engineer
First District
Charleston, West Virginia 25301

Fred VanKirk
Commissioner -
State Highway Engineer

December 07, 1992

RECEIVED
DEC 11 1992
OFFICE OF WASTE MANAGEMENT
UST SECTION
CHARLESTON, WV 25301-1401

Mr. Wayne Wilson
District Five Field Engineer
WV Division of Natural Resources
U. S. T. Office
1356 Hansford Street
Charleston, WV 25301

RE: Closure No. C-2511-92
W. V. ID No. 2002608
Material Control Division
Michigan Avenue
Charleston, WV

Dear Mr. Wilson:

In reference to the above closure numbers, please find attached DNR Closure Report for the removal of a 1000 gallon used oil storage tank at the above location.

Also attached is a copy of the soil test results and corrective action. No further activity is planned at this location.

Should you need additional information please contact Mr. Jones at 558-7836.

Very truly yours,

Joseph T. Deneault

Joseph T. Deneault
District Engineer

JTD:MJ:hah

Attachment
CC: ME, Don Post
File

TANK CLOSURE REPORT FOR:
(Complete One for Each Tank)
WV I.D. No. 2002608
(If None, write None)
Closure No. C-2511-92

Company name W. V. Division of Highways
Address Equipment Division
Buckhannon W. V. 26201
Telephone no. (304) 472-1750

I. Tank closure:

A. Liquid waste:

1) Type of liquid waste emptied from tank: USED OIL.
2) Amount of liquid waste emptied from tank: 1000 gallon.
3) Disposal method of liquid waste ~~location~~ Waste Oil Contractor and location (Safty Clean Co.).

B. Solid waste (sludges, scale, etc.):

1) Amount cleaned from tank: 150 Gal ± Stored in Drums @ Nitro.
2) Disposal method and location facility to be disposed under Waste Contract.
3) Describe tank cleaning and vapor purging methods: Tank was transported to Dist. One HQ where ends of tank were removed, and inside was cleaned with high pressure water. This material was cycled through the oil/water separator.

II. Tank abandonment only (Date): N/A
A. Type of inert material used to fill tank:

III. Tank removal only (Date 6/13/92):
A. Tank destination Tank stored @ D&M. facility @ Penn. Ave (U.S. 119) off of I-77, Charleston.
B. Future use of tank: Junk.

IV. Piping closure (Date N/A):
A. Length of piping between tank and product dispenser: None feet.
B. Piping closure method: Note: Tank was used for storage of used oil. 3'± stand pipe.

V. Site Assessment (Date 6/13/92):

A. Free product present: Yes ✓ No ____.
B. Sampling:

1) Date of sampling: 6/13/92
2) Type of sampling device: Soils Trowel
Water
3) Type of sample container: Soils 902 Jar.
Water
4) Composite samples: Yes ✓ No ____.

C. Analysis:
1) Lab name: Technical Testing Laboratories
2) Date sample analyzed: 6/16/92 (Copies Att.) (NOTE: Provide Lab QA Plan).
3) A copy of original sample report as received from lab must be available upon request.

D. Provide a diagram of sample locations and depths.

Report completed by: C Michael Power Date: 11/20/92

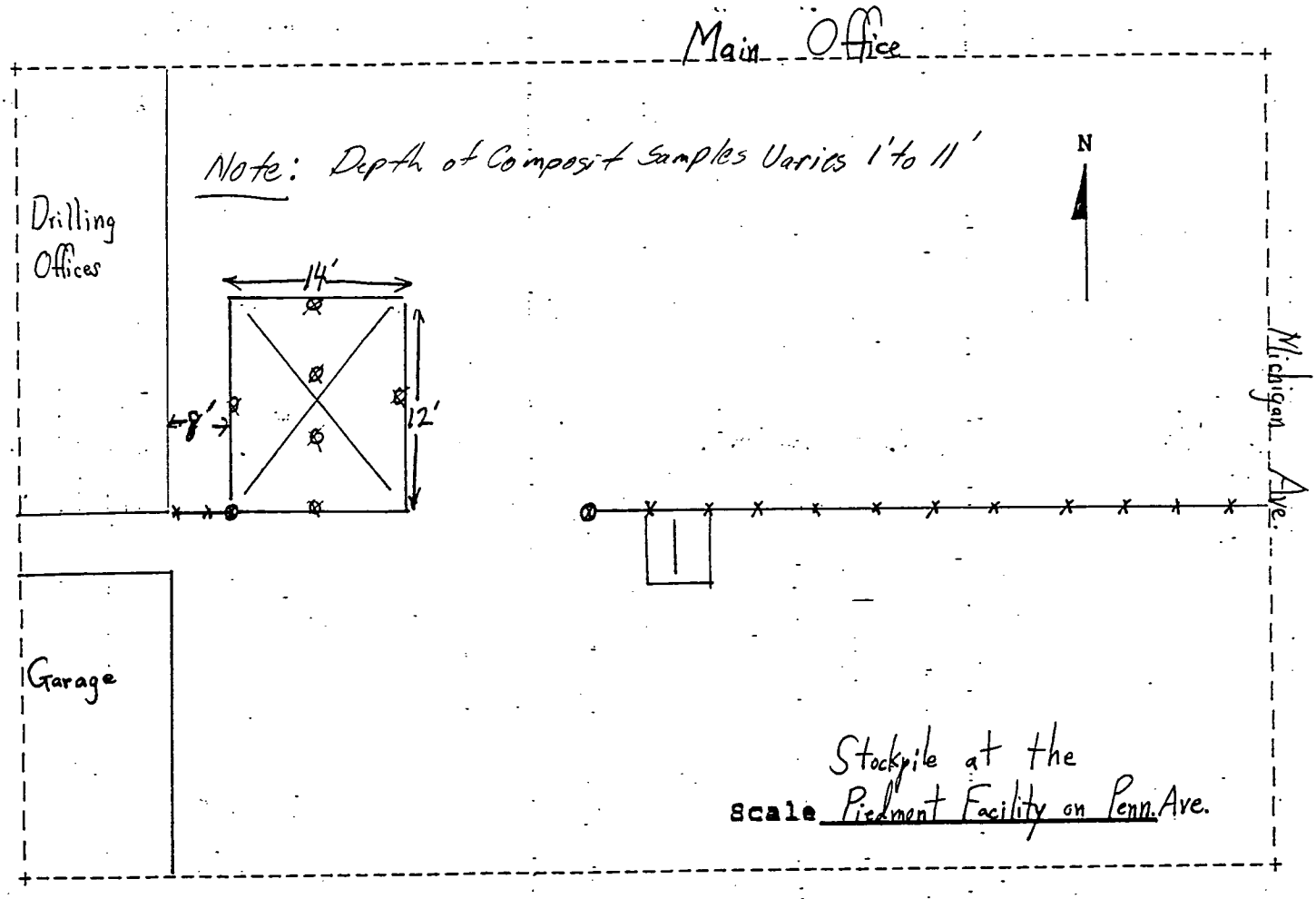
Rev. 10-89

WEST VIRGINIA DIVISION OF HIGHWAYS

UNDERGROUND STORAGE TANK PROGRAM

LOCATION DIAGRAM

Location MCS+T, Michigan Ave. Charleston.



Scale

Note:

Show location and depth of each sample by Sample ID Number. Show limits of excavation and significant surrounding buildings and terrain features.

Prepared by: Jeff K Beverly

F1-

Closure No. C-2511-92
WV. ID. No. 2002600
WV. Division of Highways
Material Control Soil Testing Division
Michigan Avenue
Charleston, WV

280.61:

On 5/18/92 the above closure numbers were obtained for the removal of a 1000 gallon underground storage tank which was used exclusively for the storage of used oil.

280.62:

On 5/18/92 the divisions waste oil contracts (Safety Clean) removed the contents of the tank. The tank was scheduled for removal on 6/13/92, at the time approximately 150 gallons of used oil and sludge was removed from the tank and the tank was removed from the ground. Approximately 50 ± gallons of used oil was present in the excavated area which was removed by excavating.

280.63:

The site is located on Michigan Avenue in Charlestons East End in a mostly residential area. The area is served by a municipal water and sewer system. Sub-surface conditions consist of sandy clay material and according to the soil test results the contamination was contained within the excavated area. The stockpiled material stored at the divisions facility on Pennsylvania Avenue was disposed of at the Sycamore Landfill at Hurricane, Putnam County West Virginia.

280.64

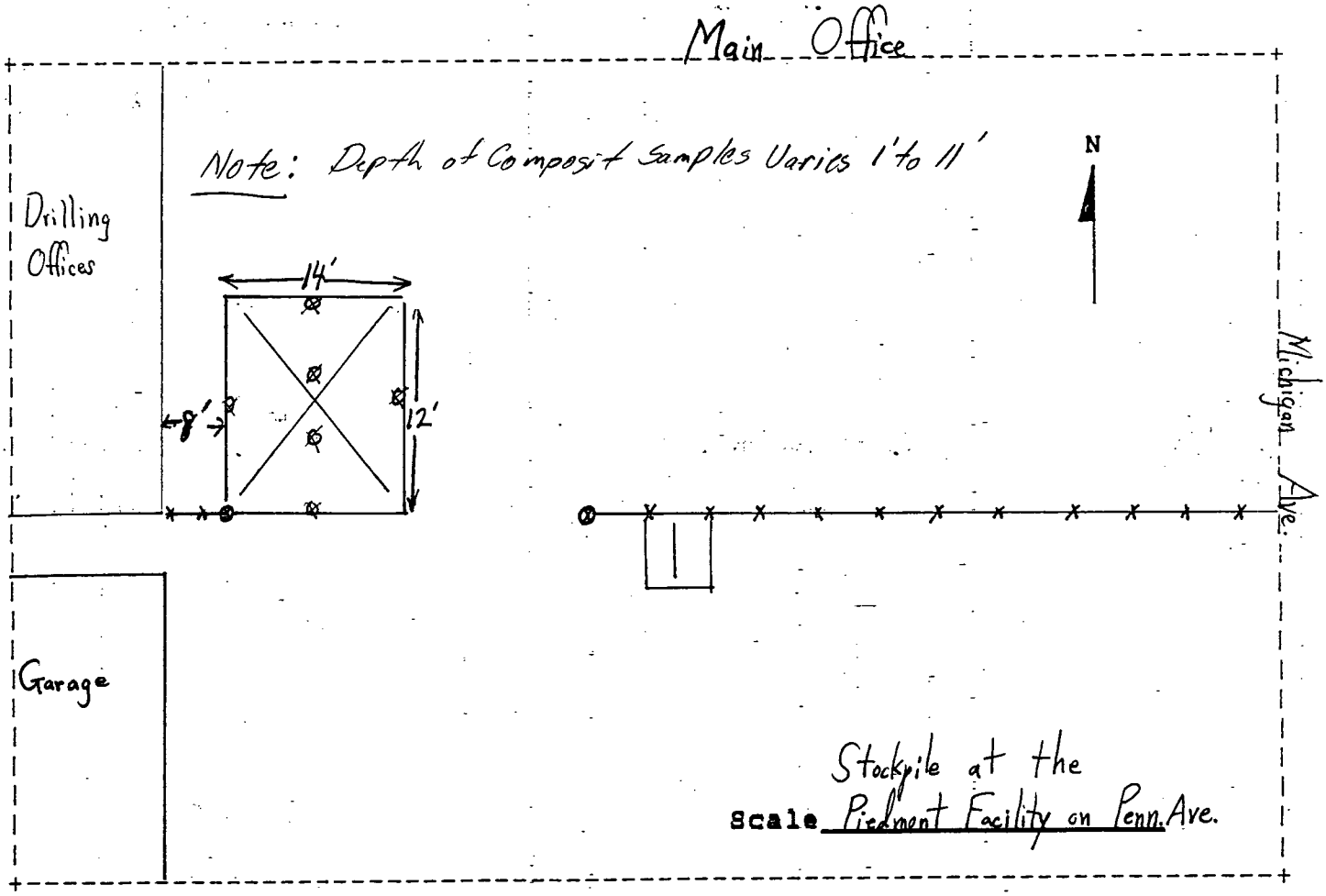
Mr. Jeff Beverly, District One Safety Inspector and Mr. Wayne Hess, Buildings and Grounds Supervisor, were present during the removal of free product. The material was excavated along with an additional two (2) feet ± of material and stock piled at our Pennsylvania Avenue complex and samples of the excavated area obtained.

WEST VIRGINIA DIVISION OF HIGHWAYS

UNDERGROUND STORAGE TANK PROGRAM

LOCATION DIAGRAM

Location MCS+T, Michigan Ave. Charleston.



Scale

Note:

Show location and depth of each sample by Sample ID Number. Show limits of excavation and significant surrounding buildings and terrain features.

Prepared by: Jeff K Beverly

West Virginia Department of Transportation
Division of Highways
Underground Storage Tank Sample
Chain of Custody Record

Sample Site W.V. Division of Highways, MCS+T Section

Address Michigan Ave., Charleston, W.V.

Project # and/or Organization # 00-70 / EEXP019

Date of Collection 6-13-92

Date of Sample Shipment 6-15-92 How Shipped Hand Carried

3-Day Turn-around

SAMPLE LOG AND ANALYSES REQUEST			Analyses Request									
Sample ID Number	Depth	Containers # and Type	TPH	BTEX	EP TOX LEAD	HAZ. WASTE	EP TOXICITY	FLASH	Ph			Remarks
(1A)		19 oz glass jar.	X									Composit of Excavation
(3A)		19 oz. glass jar	X									Composit of Stockpile

Sampled by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	6-15-92 11:00AM		

* This tank was used exclusively for the storage of used auto oil.

Sketch of sample location on reverse side.

(Excavated Area)

TECHNICAL TESTING LABORATORIES

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

LABORATORY ANALYSIS REPORT

Jim Youngblood
WV DEPT. OF HIGHWAYS-SAFETY SECTION
1-A COMPOSITE OF EXCAVATION
H00-70 EEXP019 MICHIGAN AVE.

Laboratory Number 292-06-0302-001
Date Sampled 06/13/92
Date Received 06/15/92

Respectfully Submitted,

Sampled by CLIENT

061792 1550

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

PARAMETER	RESULT	MDL	UNITS	METHOD	ANALYZED DATE/TIME/ANALYST
Total Petroleum Hydrocarbons	ND	40	ug/G	TPH	06/16/92 12:12 MHS

ND: Not detected at a concentration greater than or equal to the MDL - Method Detection Limit.

TPH: Method EPA 418.1 modified for soil.

(Stockpile)

TECHNICAL TESTING LABORATORIES

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

LABORATORY ANALYSIS REPORT

Jim Youngblood
WV DEPT. OF HIGHWAYS-SAFETY SECTION
3-A COMPOSITE OF STOCKPILE
#00-70 EEXP019 MICHIGAN AVE.

Laboratory Number 292-06-0302-002
Date Sampled 06/13/92
Date Received 06/15/92

Respectfully Submitted:
R C Murphy

Sampled by CLIENT

061792 1550

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

PARAMETER	RESULT	MDL	UNITS	METHOD	ANALYZED DATE/TIME/ANALYST
Total Petroleum Hydrocarbons	2900	40	ug/G	TPH	06/16/92 12:17 MHS D

TPH: Method EPA 418.1 modified for soil.

D: Result was obtained from the 1/10 dilution.

CAUTION

DUE TO THE CONDITION OF THE ORIGINAL DOCMENT(S), THE FOLLOWING IMAGE(S) MAY BE OF POOR QUALITY.

E-CONT-TGC

RECEIVED
92 AUG 19 AM 9 56
ENFORCEMENT
DIVISION

West Virginia Department of Transportation
Division of Highways
Underground Storage Tank Sample
Chain of Custody Record

Sample Site W.V. Division of Highways MCS&T Section

Address Michigan Ave, Charleston WV

Project # and/or Organization # OC-70 / EED019

Date of Collection 8-7-92

Date of Sample Shipment 8-7-92 How Shipped Hand Carried

3 Day Turnaround

SAMPLE LOG AND ANALYSES REQUEST			Analyses Request								
Sample ID Number	Depth	Containers # and Type	TPH	BTEX	EP TOX LEAD	HAZ. WASTE	EP TOXICITY	FLASH	Pb	TCLP-Pest/Herb	Remarks
4A	Composite		X							X	Composite of Stockpile

Sampled by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	8-7-92 11:30 AM	[signature]	8-7-92 11:5

Sketch of sample location on reverse side.

55 Tons Mike Jones

TECHNICAL TESTING LABORATORIES

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

LABORATORY ANALYSIS REPORT

Jim Youngblood
WV DEPT. OF HIGHWAYS-SAFETY SECTION
4A COMPOSITE OF STOCKPILE
MICHIGAN AVE., CHARLESTON, WV

Laboratory Number 292-08-0099-000
Date Sampled 08/07/92
Date Received 08/07/92

Respectfully Submitted:

J. Pauley

R0081892 1116

Sampled by CLIENT

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

PARAMETER	RESULT	MDL	UNITS	METHOD	ANALYZED DATE/TIME/ANALYST
Total Petroleum Hydrocarbons	1700	40	ug/G	TPH	08/10/92 14:00 MHS D

METHOD REFERENCE TPH: Method EPA 418.1 modified for soil.

D: Result was obtained from the 1/10 dilution.

1256 GREENBRIER STREET, CHARLESTON, WEST VIRGINIA 25311 — TELEPHONE 304-346-0725
4643 BENSON AVENUE, BALTIMORE, MARYLAND 21227 — TELEPHONE 301-247-7400
4440 GLEN ESTE-WITHAMSVILLE ROAD, SUITE 900, CINCINNATI, OHIO 45245 — TELEPHONE 513-752-9696

SGS Member of the SGS Group (Société Générale de Surveillance)

TECHNICAL TESTING LABORATORIES

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

LABORATORY ANALYSIS REPORT

Jim Youngblood
WV DEPT. OF HIGHWAYS-SAFETY SECTION
4A COMPOSITE OF STOCKPILE
MICHIGAN AVE., CHARLESTON, WV

Laboratory Number 292-08-0099-000
Date Sampled 08/07/92
Date Received 08/07/92

Respectfully Submitted:

R081892 1116

Sampled by CLIENT

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

PARAMETER	RESULT	MDL (MG/L)	METHOD	REGULATORY LEVEL	DATE ANALYZED	TIME	ANALYST
Arsenic [As] in leachate (TCLP)	ND	0.5	SW6010	5.0	08/14/92	11:32	WHJ
Barium [Ba] in leachate (TCLP)	ND	1.0	SW6010	100	08/14/92	11:32	WHJ
Cadmium [Cd] in leachate (TCLP)	ND	0.2	SW6010	1.0	08/14/92	11:32	WHJ
Chromium [Cr] in leachate (TCLP)	ND	0.2	SW6010	5.0	08/14/92	11:32	WHJ
Lead [Pb] in leachate (TCLP)	ND	2.0	SW6010	5.0	08/14/92	11:32	WHJ
Selenium [Se] in leachate (TCLP)	ND	0.1	SW6010	1.0	08/14/92	11:32	WHJ
Silver [Ag] in leachate (TCLP)	ND	0.01	SW6010	5.0	08/14/92	11:32	WHJ
Mercury [Hg] in leachate (TCLP)	ND	0.1	SW7470	0.2	08/11/92	13:00	TS

ND: Not detected at a concentration greater than or equal to the MDL - Method Detection Limit.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Proposed Regulatory Levels: Federal Register/Vol. 51, No. 114/ June 29, 1986.

TECHNICAL TESTING LABORATORIES
A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

LABORATORY ANALYSIS REPORT

Jim Youngblood
WV DEPT. OF HIGHWAYS-SAFETY SECTION
4A COMPOSITE OF STOCKPILE
MICHIGAN AVE., CHARLESTON, WV

Laboratory Number 292-08-0099-000
Date Sampled 08/07/92
Date Received 08/07/92

Respectfully Submitted:

J. Pauley

R0081892 1116

Sampled by CLIENT

SPIKED SAMPLE ANALYSIS SUMMARY REPORT FOR TCLP METALS

Parameter Description	RESULT	SPIKE LEVEL	UNITS	Percent Recovery
QCSPIKE				
Arsenic [As] in leachate (TCLP)	2.05	2.0	mg/L	102%
Barium [Ba] in leachate (TCLP)	0.64	0.60	mg/L	107%
Cadmium [Cd] in leachate (TCLP)	0.54	0.60	mg/L	90 %
Chromium [Cr] in leachate (TCLP)	0.55	0.60	mg/L	92 %
Lead [Pb] in leachate (TCLP)	2.54	2.0	mg/L	127%
Selenium [Se] in leachate (TCLP)	1.08	1.0	mg/L	108%
Silver [Ag] in leachate (TCLP)	0.24	0.60	mg/L	40 %
Mercury [Hg] in leachate (TCLP)	0.003	0.003	mg/L	100%

All spike results are corrected for the sample background.

$$\text{Percent Recovery} = \frac{\text{BACKGROUND CORRECTED SPIKE RESULT}}{\text{SPIKE LEVEL}} \times 100$$

1256 GREENBRIER STREET, CHARLESTON, WEST VIRGINIA 25311 — TELEPHONE 304-346-0725
4643 BENSON AVENUE, BALTIMORE, MARYLAND 21227 — TELEPHONE 301-247-7400
4440 GLEN ESTE-WITHAMSVILLE ROAD, SUITE 900, CINCINNATI, OHIO 45245 — TELEPHONE 513-752-9696

SGS Member of the SGS Group (Société Générale de Surveillance)

TECHNICAL TESTING LABORATORIES

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

LABORATORY ANALYSIS REPORT

Jim Youngblood
WV DEPT. OF HIGHWAYS-SAFETY SECTION
4A COMPOSITE OF STOCKPILE
MICHIGAN AVE., CHARLESTON, WV

Laboratory Number 292-98-0099-000
Date Sampled 08/07/92
Date Received 08/07/92

Respectfully Submitted:

J. Pauley

Sampled by CLIENT

R081892 1116

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK
TCLP-PREPARATION DATA (Mark with "YES")	
Sample Phase	
Solid	YES
Sludge	
Liquid	
Suspended Solids,%	
>0.5	YES
<0.5	
Sample Treatment	
Extracted,Filtered, and Analyzed	YES
Filtered, and Analyzed	
Bottle Extraction Date & Analyst	-- SW1311 08/09/92 14:00 AM

TCLP Extraction Procedure and Regulatory Levels: 40CFR; Part 261; Appendix II.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

1256 GREENBRIER STREET, CHARLESTON, WEST VIRGINIA 25311 — TELEPHONE 304-346-0725
4643 BENSON AVENUE, BALTIMORE, MARYLAND 21227 — TELEPHONE 301-247-7400
4440 GLEN ESTE-WITHAMSVILLE ROAD, SUITE 900, CINCINNATI, OHIO 45245 — TELEPHONE 513-752-9696

SGS Member of the SGS Group (Société Générale de Surveillance)

SYCAMORE LANDFILL, INC.

4301 Sycamore Ridge Road
Hurricane, WV 25526

Invoice No: 37779

Phone: (304) 562-3398
Phone: (215) 338-1230

Residential ☐
Commercial ☑

Date: 9-14-92

Name of Customer: W. VA. DIV. OF HWY Account Number: _____

Truck Number: 371-306 Trailer Number: _____

Trucking Company: W. VA - DIV. of HWY

Type of Trailer:

Flat Bed _____ Box _____ Cabled _____ ☐ Yes ☐ No

Weight:

07:04 AM 14 SEP 92 28040 LB GR
07:14 AM 14 SEP 92 16520 LB GR

Gross: _____ Tare: _____ Net Lbs.: 28040? 11,520#

Tons: 5.9CT.

Total Cubic Yards _____

State Tax $ _____

County Tax $ _____

Dumping Fee $ _____

Other Fee $ _____ P.O.# 01-00319

Total $ 329.47

135.34 #19411

Driver's Signature:

Printed: _____

Written: X _____

Where Refuse Came From: KAN-[redacted] CO.

Company Name (Broker): PIEDMONT

Address: 25301 MICH. AVE. CHARLESTON

City: _____

SYCAMORE LANDFILL, INC.

4301 Sycamore Ridge Road
Hurricane, WV 25526

Invoice № 37780

Residential ☐
Commercial ☑

Phone: (304) 562-3398
Phone: (215) 338-1230

Date: 9-14-92

Name of Customer: W.VA. DIV. OF HWY. Account Number: _____

Truck Number: 371-304 Trailer Number: _____

Trucking Company: W.VA. DIV. OF HWY

Type of Trailer:

Flat Bed _____ Box _____ Cabled _____ ☐ Yes ☐ No

Weight:

07:05 AM 14 SEP 92 28620 LB GR
07:14 AM 14 SEP 92 16500 LB GR

Gross: _____ Tare: _____ Net Lbs.: 12120

Tons: _____

Total Cubic Yards _____

State Tax $ _____

County Tax $ _____

Dumping Fee $ _____

Other Fee $ _____

Total $ 142.41 ✓ CJ PO # 01-00314

Driver's Signature:

Printed: _____

Written: X _____

Where Refuse Came From: KAN. [redacted] CO.

Company Name (Broker): PIEDMONT

Address: 25301 MICH. AVE. CHARLESTON

City: _____

SYCAMORE LANDFILL, INC.

4301 Sycamore Ridge Road
Hurricane, WV 25526

Invoice No. 37804

Residential ☐
Commercial ☑

Phone: (304) 562-3398
Phone: (215) 338-1230

Date: 9-14

Name of Customer: W.VA. DIV. OF HWY Account Number: _____

Truck Number: 371-306 Trailer Number: _____

Trucking Company: _____

Type of Trailer:

Flat Bed _____ Box _____ Cabled _____ ☐ Yes ☐ No

Weight:

09:13 AM 14 SEP 92 28140 LB GR 5.95T.

Gross: _____ Tare: 09:16 AM 14 SEP 92 16440 LB GR Net Lbs.: 11700

Tons: _____

Total Cubic Yards _____

State Tax $ _____

County Tax $ _____

Dumping Fee $ _____ PO # 01-00319

Other Fee $ _____

Total $ 137.47

Driver's Signature:

Printed: _____

Written: _____

Where Refuse Came From: KAN. CO.

Company Name (Broker): PEIDMONT - MICH. AVE. 25301

Address: CHARLESTON W.VA.

City: _____

SYCAMORE LANDFILL, INC.

4301 Sycamore Ridge Road
Hurricane, WV 25526

Invoice No. 37802

Phone: (304) 562-3398
Phone: (215) 338-1230

Residential ☐
Commercial ☑

Date: 9-14-92

Name of Customer: W.VA. DIV. of HWY Account Number: _____

Truck Number: 377-146 Trailer Number: _____

Trucking Company: _____

Type of Trailer:

Flat Bed _____ Box _____ Cabled _____ ☐ Yes ☐ No

Weight:

09:12 AM 14 SEP 92 49780 LB GR
09:16 AM 14 SEP 92 24640 LB GR
12.577

Gross: _____ Tare: _____ Net Lbs.: 25140

Tons: _____

Total Cubic Yards _____

State Tax $ _____

County Tax $ _____

Dumping Fee $ _____

Other Fee $ _____

Total $ 295.39 ✓

01-00319
P.O.

Driver's Signature:

Printed: _____

Written: M. L. Tenarley

Where Refuse Came From: KAN. CO

Company Name (Broker): _____

Address: PEIDMONT - MICH. AVE. 25301

City: CHARLESTON W.VA.

SYCAMORE LANDFILL, INC.

4301 Sycamore Ridge Road
Hurricane, WV 25526

Invoice No: 37805

Residential ☐
Commercial ☒

4.56 T.

Phone: (304) 562-3398
Phone: (215) 338-1230

Date: 9-14-92

Name of Customer: W.VA. DIV. OF HWY Account Number:

Truck Number: 371-449 Trailer Number:

Trucking Company:

Type of Trailer: 5.90 T.

Flat Bed Box Cabled ☐ Yes ☐ No

09:14 AM 14 SEP 92 27820 LB GR

Weight:

Gross: Tare: 09:17 AM 14 SEP 92 16220 LB GR Net Lbs.: 11600 ✓

Tons:

Total Cubic Yards

State Tax $

County Tax $

Dumping Fee $

Other Fee $ ✓

Total $ 136.30 ✓

PO# 01-00319

Driver's Signature:

Printed:

Written: X

Where Refuse Came From: KAN. CO

Company Name (Broker): PIEDMONT - MICH. AVE. 25301

Address: CHARLESTON W. VA -

City:

SYCAMORE LANDFILL, INC.

4301 Sycamore Ridge Road
Hurricane, WV 25526

Invoice No. 37803

Residential ☐
Commercial ☒

Phone: (304) 562-3398
Phone: (215) 338-1230

Date: 9-14-92

Name of Customer: W. VA. DIV. OF HWY Account Number:

Truck Number: 377-166 Trailer Number:

Trucking Company:

Type of Trailer: 11.77

Flat Bed Box Cabled ☐ Yes ☐ No

Weight: 09:13 AM 14 SEP 92 48920 LB GR

Gross: Tare: 09:17 AM 14 SEP 92 26320 LB GR Net Lbs.: 22600

Tons:

Total Cubic Yards

State Tax $

County Tax $

Dumping Fee $ PO# 01-00319

Other Fee $ ✓

Total $ 265.55

Driver's Signature:

Printed:

Written:

Where Refuse Came From: KAN. CO.

Company Name (Broker):

Address: PEIDMONT - MICH. AVE. 25301

City: CHARLESTON W.VA.

2002608 #4 4708

WEST VIRGINIA
DEPARTMENT OF TRANSPORTATION

GASTON CAPERTON
Governor

State Capitol Complex · Building Five · Charleston, West Virginia 25305 · 348-0444

Arthur L. Gleason, Jr.
Secretary

March 11, 1992

Mr. Gil W. Sattler
Department of Commerce, Labor &
Environmental Resources
Waste Management Section
1356 Hansford Street
Charleston, West Virginia 25301

Dear Mr. Sattler:

In accordance with our recent telephone conversation, please change the mailing address on Underground Storage Tank matters to;

West Virginia Division of Highways
Equipment Division
Post Office Box 610
Buckhannon, West Virginia 26201

Attention: Mr. Don E. Post
Fleet Planning Supervisor

Position responsibilities have changed since the Underground Storage Tank Program began. Tanks are now managed statewide by Mr. Post. Routing of pertinent correspondence to that office would be more efficient.

Thank you for your cooperation.

Sincerely,

Randall G. Biller
Executive Assistant

RGB:e

cc: HM, ME

IDNUMBER: 03902608

OWNER	LOCATION
WV DEPT OF HIGHWAY 1900 WASHINGTON ST EAST CHARLESTON, WV 25305	M C S T & D 312 MICHIGAN AVE CHARLESTON, WV 25311 COUNTY: KANAWHA

TANKS: 1
UST_TANK: 1

INV_NO: 882295
UST_TOT: 3.39
LUST_TOT: 17.02
INV_TOT: 20.41

DT_PAID: .
AMT_PD: 20.41
CK_NO: .
MO_NO: .

CREDIT TO: IGT

ID# 2002608

STATE OF WEST VIRGINIA
DEPARTMENT OF COMMERCE, LABOR AND ENVIRONMENTAL RESOURCES
WASTE MANAGEMENT SECTION
1356 Hansford Street
Charleston, West Virginia 25301
Telephone (304) 348-6371

GASTON CAPERTON
Governor

J. EDWARD HAMRICK III
Director

ANN A. SPANER
Deputy Director

NOTICE OF CLOSURE

TO: Underground Storage Tank Owners and/or Operators

FROM: Underground Storage Tank Program
West Virginia Division of Natural Resources
Waste Management Section

DATE OF NOTICE: 5/12/92 EXPIRATION DATE: 7/12/92

This office has received your notice of tank removal and/or closure. Your site has been assigned closure number C-2511 -92. Please refer to this number on any further correspondence concerning this closure. The tank closure is not to begin until 30 days after the date of notice. The site assessment may be performed during those 30 days.

If you should have any questions, please call UST Office at (304) 558-6371.

Owner/Operator Mailing Address:
WV Div of Highways
PO Box 610 - Equipment Div
Buckhannon, WV 26201
Attn: Don Post

Location of tanks:
MC 5T0 N
312 Michigan Ave
Charleston, WV 25311

Date: 5/15/92
Signed: [signature]

Instructions:
1. Contact UST Office at least 5 days before beginning work.
2. If evidence of contamination if found, it must be reported to the WV DNR District office within 24 hours (See attached page).
3. Copies of site assessments indicating contamination are to be mailed to the appropriate WVDNR district offices. Notification forms are to be mailed to the Charleston office.

Comments: Close /

Revised 1/92

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division Of Highways
State Capitol Complex • Building Five
Charleston, West Virginia 25305 • 304-348-3505

GASTON CAPERTON
GOVERNOR

ARTHUR L. GLEASON, JR.
SECRETARY

FRED VANKIRK
COMMISSIONER
STATE HIGHWAY ENGINEER

May 8, 1992

RECEIVED
MAY 14 1992

WASTE MANAGEMENT OFFICE
U.S.T. OFFICE
CHARLESTON, WV 25301-1401

Mr. Ken Ellison
Division of Natural Resources
1356 Hansford Street
Charleston, WV 25301

Dear Mr. Ellison:

CLOSURE NUMBER REQUEST - OLD WV ID 03902608
312 MICHIGAN AVENUE SUB-STATION-KANAWHA COUNTY
CHARLESTON, WEST VIRGINIA

The Division of Highways proposes to close one (1) UST, ED NO: UNKNOWN, at the above location. This tank is a used oil tank that is no longer in use. A decision was made to remove the tank and not to install a new tank at this location.

Very truly yours,

Donald E. Post for
Robert L. Montgomery
Director
Equipment Division

RLM/dp

cc: HM, ST, MH, District 1
District 1 Safety Inspector
ME Records Room, File



WEST VIRGINIA DEPARTMENT OF HIGHWAYS
State Capitol Complex
Building Five
Charleston West Virginia 25305

GASTON CAPERTON
GOVERNOR

FRED VANKIRK
ACTING COMMISSIONER
STATE HIGHWAY ENGINEER

TELECOPIER COVER SHEET

DATE: May 12, 1992

TO: June Casto - DNR
FAX 348-0256

FROM: Don Post - DOH
FAX 557-4246 or 472-1750

SPECIAL INSTRUCTIONS: Please Fax Closure Number to me at the Above fax Number.

Thanks
Don

NUMBER OF PAGES 1 + COVER PAGE BEING TRANSMITTED

IF THERE ARE ANY PROBLEMS WITH THIS TRANSMISSION PLEASE CONTACT:

Don Post AT (304) 472 - 1750

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division Of Highways
State Capitol Complex • Building Five
Charleston, West Virginia 25305 • 304-348-3505

GASTON CAPERTON
GOVERNOR

ARTHUR L. GLEASON, JR.
SECRETARY

FRED VANKIRK
COMMISSIONER
STATE HIGHWAY ENGINEER

May 8, 1992

Mr. Ken Ellison
Division of Natural Resources
1356 Hansford Street
Charleston, WV 25301

Dear Mr. Ellison:

CLOSURE NUMBER REQUEST - OLD WV ID 03902608
312 MICHIGAN AVENUE SUB-STATION-KANAWHA COUNTY
CHARLESTON, WEST VIRGINIA

The Division of Highways proposes to close one (1) UST, ED NO: UNKNOWN, at the above location. This tank is a used oil tank that is no longer in use. A decision was made to remove the tank and not to install a new tank at this location.

Very truly yours,

Donald E. Post for
Robert L. Montgomery
Director
Equipment Division

RLM/dp

cc: HM, ST, MH, District 1
District 1 Safety Inspector
ME Records Room, File

C-720-90

Notification for Underground Storage Tanks

OMB NO. 2050-0068, Approval Expires 9/30/91
EPA form 7530-1 (Revised 9/89)

Division of Natural Resources
Waste Management Section - UST Office
~~1400~~ 1356 Hansford Street, Charleston, WV 25301 (304) 348-6371

STATE USE ONLY

ID NUMBER 03902608

DATE RECEIVED

A. Date Entered Into Computer _____
B. Data Entry Clerk Initials _____
C. Owner Was Contacted to Clarify Responses. Comments

TYPE OF NOTIFICATION

☐ A. NEW FACILITY ☐ B. AMENDED ☐ C. CLOSURE

(6) No. of tanks at facility ____ No. of continuation sheets attached

INSTRUCTIONS

Please type or print in ink all items except "signature" in section V. This form must be completed for each location containing underground storage tanks. If more than five (5) tanks are owned at this location, photocopy the following sheets, and staple continuation sheets to the form.

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1984, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and

b) in the case of any underground storage tank in use before November 8, 1984, but no longer is use on that date, any person who owned such tank immediately before the discontinuation of its use.

c) if the State agency so requires, any facility that has undergone any changes to facility information or tank system status (only amended tank information needs to be included).

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. Gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situate upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to under ground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum (e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Send completed forms to:

RECEIVED
MAY 9 1990
DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use. 3. If the State requires notification of any amendments to facility send information to State agency immediately.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
Division of Highways

Street Address
Capitol Complex Bg 5

City: Charleston State: WVA ZIP Code: 25311

County: Kanawha

Phone Number (Include Area Code)
(304) 348-2915

II. LOCATION OF TANK(S)

If required by State, give the geographic location of tanks by degrees, minutes, and seconds. Examples Lat. 42, 36, 12 N Long. 85, 24, 17W

Latitude _____ Longitude _____

(if same as Section I, mark box here ☒)

Facility Name or Company Site Identifier, as applicable
Materials Control Soil and Testing Division

Street Address (P.O. Box not acceptable)
312 Michigan Av.

City: Charleston State: W.VA. Zip code: 25311

County: Kanawha Municipality: _____

III. TYPE OF OWNER

- ☐ Federal Government
- ☐ Commercial
- ☑ State Government
- ☐ Private
- ☐ Local Government

IV. INDIAN LANDS

Tanks are located on land within an Indian Reservation or on other trust lands. ☐

Tanks are owned by native American nation, tribe, or individual. ☐

Tribe or Nation: _____

V. TYPE OF FACILITY

Select the Appropriate Facility Description

____ Gas Station	____ Railroad	____ Trucking/Transport
____ Petroleum Distributor	____ Federal - Non-Military	____ Utilities
____ Air Taxi (Airline)	____ Federal - Military	____ Residential
____ Aircraft Owner	____ Industrial	____ Farm
____ Auto Dealership	____ Contractor	✓ Other (Explain) State Maintenance Garage

VI. CONTACT PERSON IN CHARGE OF TANKS

Name	Job Title	Address	Phone Number (Include Area Code)

VII. FINANCIAL RESPONSIBILITY

I have met the financial responsibility requirements in accordance with 40 CFR Subpart H ☐

Check All that Apply

✓ Self Insurance	☐ Guarantee	☐ State Funds
☐ Commercial Insurance	☐ Surety Bond	☐ Trust Fund
☐ Risk Retention Group	☐ Letter of Credit	☐ Other Method Allowed Specify

_____

VIII. CERTIFICATION (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true,accurate, and complete.

Name and official title of owner or owner's authorized representative (Print)	Signature	Date Signed
Division of Highways	John E. Taylor	5/2/90

EPA estimates public reporting burden for this form to average 30 minutes per response including time for reviewing instructions, gathering and maintaining the data needed and completing and reviewing the form. Send comments regarding this burden estimate to Chief, Information Policy Branch PM-223, U.S. Environmental Protection Agency, 401 M Street, Washington D.C. 20460, marked "Attention Desk Officer for EPA." This form amends the previous notification form as printed in 40 CFR Part 280, Appendix I. Previous editions of this notification form may be used while supplies last.

IX. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification Number	Tank No.____	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____
1. Status of Tank (mark only one) — Currently in Use					
Temporarily Out of Use (Remember to fill out section IX.)					
Permanently Out of Use (Remember to fill out section IX.)	✓				
Amendment of Information					
2. Date of Installation (mo./year)	1/66				
3. Estimated Total Capacity (gallons)	6,000				
4. Material of Construction (Mark all that apply)					
Asphalt Coated or Bare Steel	✓				
Cathodically Protected Steel					
Epoxy Coated Steel					
Composite (Steel with Fiberglass)					
Fiberglass Reinforced Plastic					
Lined Interior					
Double Walled					
Polyethylene Tank Jacket					
Concrete					
Excavation Liner					
Unknown					
Other, Please specify					
Has tank been repaired?					
5. Piping (Material) (Mark all that apply) — Bare Steel					
Galvanized Steel	✓				
Fiberglass Reinforced Plastic					
Copper					
Cathodically Protected					
Double Walled					
Secondary Containment					
Unknown					
Other, Please specify					
6. Piping (Type) (Mark all that apply)					
Suction: no valve at tank	✓				
Suction: valve at tank					
Pressure					
Gravity Feed					
Has piping been repaired?					

Tank Identification Number	Tank No.____	Tank No.____	Tank No. ____	Tank No. ____	Tank No. ____
7. Substance Currently or Last Stored In Greatest Quantity by Volume					
Gasoline	✓				
Diesel					
Gasohol					
Kerosene					
Heating Oil					
Used Oil					
Other, Please specify					
Hazardous Substance CERCLA name and/or, CAS number					
Mixture of Substances Please specify					
X. TANKS OUT OF USE, OR CHANGE IN SERVICE					
1. Closing of Tank					
A. Estimated date last used (mo./day/year)	1/11/90				
B. Estimate date tank closed (mo./day/year)	4/3/90				
C. Tank was removed from ground	✓				
D. Tank was closed in ground					
E. Tank filled with inert material					
Describe					
F. Change in service					
2. Site Assessment Completed	4/24/90				
Evidence of a leak detected	✓				

0390608

WEST VIRGINIA DEPARTMENT OF HIGHWAYS

State Capitol Complex
Building Five
Charleston, West Virginia 25305

GASTON CAPERTON
GOVERNOR

FRED VANKIRK
ACTING COMMISSIONER
STATE HIGHWAY ENGINEER

May 4, 1990

RECEIVED
MAY 9 1990
DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION

Mr. Ken Ellison
Department of Natural Resources
1260 Greenbrier Street
Charleston, West Virginia 25311

Dear Mr. Ellison:

Closure Number C-720-90
312 Michigan Avenue - Kanawha County
Charleston, West Virginia

Please find attached Closure Number C-720-90 and EPA form 7530-1 (9-89), Notification for Underground Storage Tanks. This is for the removal of ED. NO. 729-0036 by Division of Highways' crews at the above location. This tank is being closed and not replaced.

Very truly yours,

Julian W. Ware

Julian W. Ware
Acting Director
Maintenance Division

JWW:dp

Attachments

cc: MM, ME, HM, MH, RC, ST

TANK CLOSURE REPORT FOR:
(Complete One for Each Tank)
WV I.D. No. 03902608
(If None, write None)
Closure No. C-720-90

Company name WVDOH - MCS&TD
Address 312 Michigan Ave.
Telephone no. 348-3039

I. Tank closure:

A. Liquid waste:

1) Type of liquid waste emptied from tank: Water/Gas.
2) Amount of liquid waste emptied from tank: ≈ 1400 gallon.
3) Disposal method of liquid waste Fuel blending and location Nitro.

B. Solid waste (sludges, scale, etc.):

1) Amount cleaned from tank: .
2) Disposal method and location .
3) Describe tank cleaning and vapor purging methods:

II. Tank abandonment only (Date):
A. Type of inert material used to fill tank: .

III. Tank removal only (Date 4/17/90):
A. Tank destination Buckhannon Equipment Garage.
B. Future use of tank: Scrap.

IV. Piping closure (Date 4/17/90):
A. Length of piping between tank and product dispenser: 15 feet.
B. Piping closure method: Removed.

V. Site Assessment (Date 4/17/90):

A. Free product present: Yes ____ No ✓.
B. Sampling:

1) Date of sampling: 4/17/90
2) Type of sampling device: Soils Scoop
Water Bailer.
3) Type of sample container: Soils Glass Jars
Water Glass Jar.
4) Composite samples: Yes ✓ No ____.

C. Analysis:
1) Lab name: REIC Laboratories.
2) Date sample analyzed: 4/23/90 (NOTE: Provide Lab QA Plan).
3) A copy of original sample report as received from lab must be available upon request.

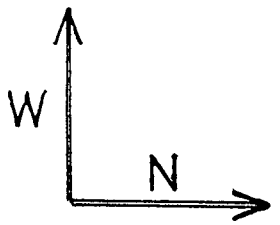
D. Provide a diagram of sample locations and depths.

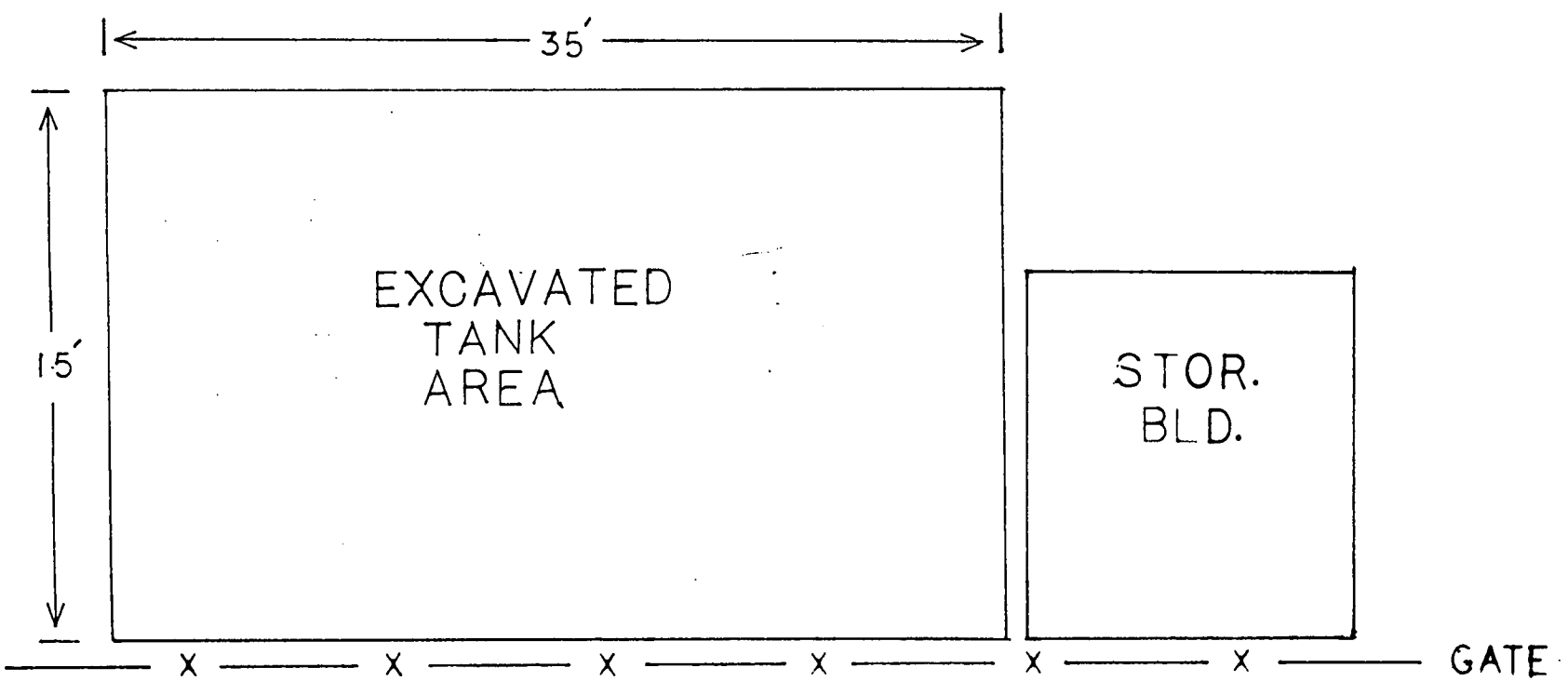
Report completed by: John Taylor Date: 4/24/90

Rev. 10-89

SAMPLE DEPTHS COMPOSITED

NW	3,6,9 FEET
E W	SAME
S W	SAME
W W	SAME
BOT	10 FEET





MIR NO:
PROJECT NO:
BRIDGE NO:

PAGE NO.

ATTACHMENT NO:

REIC Laboratory

Drawer G, Cool Ridge, WV 25825

Custody

CHAIN OF CUSTODY RECORD

Date: 4/18/90

Customer Name West Virginia Division of Highways (MCS+TD)

Address 312 Michigan Ave.
Charleston W.VA. 25311

Person to Contact John E. Taylor Telephone 348-3030

Billing Address 312 Michigan Ave.
Charleston W.VA. 25311

Sample Collection Information

Sampling Site MCS+TD

Project # 729-0036

Date of Collection 4/17/90

Date of Sample Shipment 4/18/90 How Shipped

SAMPLE LOG
AND ANALYSES REQUEST

3 DAY TURNAROUND
MUST HAVE BY MONDAY

REIC Use Only	Sample ID Number	Matrix	Grab / Comp.	Containers # and Type	Analyses Requested: TPH	Remarks
	NW				✓	Run EP Tox Lead on "Highest" TPH Sample
	SW				✓	
	EW				✓	
	WW				✓	
	BOT.				✓	
	WAT.				✓	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Condition on Arrival:	
		[signature]	4/18/90 11:00	OK	

Comments RUSH

Possible Interfering Compounds

Requested by John Taylor

Research, Environmental and Industrial Consultants, Incorporated
Drawer G, Cool Ridge, WV 25825 / 1-800-999-0105 or 304-787-3700 / FAX: 304-787-3252

Quality Analytical Services

REIC Laboratory

Research, Environmental & Industrial Consultants, Inc.

Drawer G • Cool Ridge, West Virginia 25825 • 1-304-787-3700
1-800-999-0105
FAX 1-304-787-3252

**********ANALYSIS REPORT**********

JOB #: 0490-2603
SERVICES FOR: WV Department of Highways
DATE SUBMITTED: 4-19-90 DATE COMPLETED: 4-23-90
METHOD OF ANALYSIS: AS NOTED BELOW
CUSTOMER JOB IDENTIFICATION: 729-0036

****

REIC SAMPLE #	DOH SAMPLE #	TPH	METHOD	MQL
		---mg/kg---		
2603-1	NW	61	418.1	20
2603-2	SW	38	418.1	20
2603-3	EW	37	418.1	20
2603-4	WW	40	418.1	20
2603-5	BOT	91	418.1	20
		---mg/l---		
2603-6	WAT	7.2	418.1	0.5

REIC SAMPLE #	2603-1	2603-2	METHOD	MQL
DOH SAMPLE #	NW	SW		
	--------mg/kg--------			
benzene	0.171	ND	8240	0.100
toluene	0.754	ND	8240	0.100
ethylbenzene	0.230	ND	8240	0.100
xylene	1.16	ND	8240	0.100

REIC SAMPLE #	2603-3	2603-4		
DOH SAMPLE #	EW	WW	METHOD	MQL
	--------mg/kg--------			
benzene	ND	ND	8240	0.100
toluene	ND	ND	8240	0.100
ethylbenzene	ND	ND	8240	0.100
xylene	ND	ND	8240	0.100

REIC SAMPLE #	2603-5		
DOH SAMPLE #	BOT	METHOD	MQL
	---mg/kg--		
benzene	ND	8240	0.100
toluene	ND	8240	0.100
ethylbenzene	ND	8240	0.100
xylene	ND	8240	0.100

REIC SAMPLE #	2603-6		
DOH SAMPLE #	WAT	METHOD	MQL
	------mg/l-----		
benzene	ND	8240	0.020
toluene	0.102	8240	0.020
ethylbenzene	0.049	8240	0.020
xylene	0.231	8240	0.020

CAUTION

DUE TO THE CONDITION OF THE ORIGINAL DOCMENT(S), THE FOLLOWING IMAGE(S) MAY BE OF POOR QUALITY.

REIC SAMPLE #	2603-1	2603-2		
DOH SAMPLE #	NW	SW	METHOD	MQL
	---------mg/l---------			
EP TOX Lead	ND	ND	7421	0.010
Initial pH	6.88	6.99		
Final pH	5.13	4.84		
Total Acetic Acid	10 ml	10 ml		

REIC SAMPLE #	2603-3	2603-4		
DOH SAMPLE #	EW	WW	METHOD	MQL
	---------mg/l---------			
EP TOX Lead	ND	ND	7421	0.010
Initial pH	6.23	7.44		
Final pH	4.80	4.99		
Total Acetic Acid	9 ml	10 ml		

REIC SAMPLE #	2603-5		
DOH SAMPLE #	BOT	METHOD	MQL
	----mg/l-----		
EP TOX Lead	ND	7421	0.010
Initial pH	7.22		
Final pH	5.19		
Total Acetic Acid	45 ml		

MQL - Minimum Quantifying Level
ND - None Detected at MQL
TPH - Total Petroleum Hydrocarbons

DATE 4-23-90

ANALYSTS: Charles E. Lyons
Charles E. Lyons
Janet Satterfield
Janet Satterfield
Claude Scott
Claude Scott

id#03902608

STATE OF WEST VIRGINIA
DEPARTMENT OF COMMERCE, LABOR AND ENVIRONMENTAL RESOURCES
DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION
1356 Hansford Street
Charleston, West Virginia 25301
Telephone (304)348-5929

GASTON CAPERTON
Governor

J. EDWARD HAMRICK III
Director

LARRY W. GEORGE
Deputy Director

NOTICE OF CLOSURE

TO: Underground Storage Tank Owners and/or Operators

FROM: Underground Storage Tank Program
West Virginia Division of Natural Resources
Waste Management Section

DATE OF NOTICE: 3/20/90 EXPIRATION DATE: 5/20/90

This office has received your notice of tank removal and/or closure. Your site has been assigned closure number C-720-90. Please refer to this number on any further correspondence concerning this closure.

If you should have any questions, please call Mark Foley at (304) 348-6371.

Owner/Operator Mailing Address:
Julian W. Ware
WVa. Dept. of Highways
State Capitol Complex
Bldg. 5
Charleston, WV 25305

Location of Excavation:
Materials Division
312 Michigan Ave.
Charleston, WV

Date: 3/23/90

Signed: Jul W. Davis

Comments:
Contact Mark Foley at 348-6371 at least 5 days before beginning work

03902608 (1)
C-720-90

WEST VIRGINIA DEPARTMENT OF HIGHWAYS

State Capitol Complex
Building Five
Charleston, West Virginia 25305

GASTON CAPERTON
GOVERNOR

FRED VANKIRK
ACTING COMMISSIONER
STATE HIGHWAY ENGINEER

March 20, 1990

RECEIVED
MAR 23 1990
DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION

Mr. Ken Ellison
Department of Natural Resources
1260 Greenbrier Street
Charleston, West Virginia 25311

Dear Mr. Ellison:

Closure Number Request
Materials Division
312 Michigan Avenue, Charleston, WV

The Division of Highways proposes to close one UST at the above location. The UST is identified as:

ED# 724-0036

The tank is being closed as part of our upgrade program. A closure number is requested.

Very truly yours,

Julian W. Ware

Julian W. Ware
Acting Director
Maintenance Division

JWS:Bs

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN **WV**

RETURN COMPLETED FORM TO:

UST NOTIFICATION
DEPARTMENT OF NATURAL RESOURCES
1260 GREENBRIER STREET
CHARLESTON WV 25311

STATE USE ONLY

I.D. Number 039026 08

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and

(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: **1.** gasoline, used oil, or diesel fuel, and **2.** industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. **2.** Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: ☐

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
West Virginia Department of Highways

Street Address
1900 Washington Street, East

County
Kanawha

City: Charleston | State: WV | ZIP Code: 25305

Area Code: 304 | Phone Number: 348-0442

Type of Owner *(Mark all that apply ☒)*

☒ Current ☒ State or Local Gov't ☐ Private or Corporate
☐ Former ☐ Federal Gov't (GSA facility I.D. no. _____) ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
MCST & D

Street Address or State Road, as applicable
312 Michigan Avenue

County
Kanawha

City (nearest): Charleston | State: WV | ZIP Code: 25311

Indicate number of tanks at this location: 1

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐) | Job Title | Area Code | Phone Number
Alvin Hammonds | Supervisor | 304 | 348-3770

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative: Randall Biller, Staff Engineer
Signature: Randall Biller
Date Signed: 1-27-89

CONTINUE ON REVERSE SIDE

Owner Name (from Section I) WVDOH Location (from Section II) Charleston, WV Page No. 2 of 2 Pages

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)	Tank No. 029-0036	Tank No.	Tank No.	Tank No.	Tank No.
1. Status of Tank (Mark all that apply ☒)					
Currently in Use	☒	☐	☐	☐	☐
Temporarily Out of Use	☐	☐	☐	☐	☐
Permanently Out of Use	☐	☐	☐	☐	☐
Brought into Use after 5/8/86	☐	☐	☐	☐	☐
2. Estimated Age (Years)	20				
3. Estimated Total Capacity (Gallons)	6000				
4. Material of Construction (Mark one ☒)					
Steel	☒	☐	☐	☐	☐
Concrete	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other, Please Specify					
5. Internal Protection (Mark all that apply ☒)					
Cathodic Protection	☐	☐	☐	☐	☐
Interior Lining (e.g., epoxy resins)	☐	☐	☐	☐	☐
None	☐	☐	☐	☐	☐
Unknown	☒	☐	☐	☐	☐
Other, Please Specify					
6. External Protection (Mark all that apply ☒)					
Cathodic Protection	☐	☐	☐	☐	☐
Painted (e.g., asphaltic)	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic Coated	☐	☐	☐	☐	☐
None	☐	☐	☐	☐	☐
Unknown	☒	☐	☐	☐	☐
Other, Please Specify					
7. Piping (Mark all that apply ☒)					
Bare Steel	☐	☐	☐	☐	☐
Galvanized Steel	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
Cathodically Protected	☐	☐	☐	☐	☐
Unknown	☒	☐	☐	☐	☐
Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume (Mark all that apply ☒)					
a. Empty	☐	☐	☐	☐	☐
b. Petroleum					
Diesel	☐	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline (including alcohol blends)	☒	☐	☐	☐	☐
Used Oil	☐	☐	☐	☐	☐
Other, Please Specify					
c. Hazardous Substance	☐	☐	☐	☐	☐
Please Indicate Name of Principal CERCLA Substance					
OR Chemical Abstract Service (CAS) No.					
Mark box ☒ if tank stores a mixture of substances	☐	☐	☐	☐	☐
d. Unknown	☐	☐	☐	☐	☐
9. Additional Information (for tanks permanently taken out of service)					
a. Estimated date last used (mo/yr)	/	/	/	/	/
b. Estimated quantity of substance remaining (gal.)					
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)	☐	☐	☐	☐	☐

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN WV

RETURN COMPLETED FORM TO
UST Notification
Solid & Hazardous Waste/Ground Water Branch GB
West Virginia Dept. of Natural Resources
1201 Greenbriar Street
Charleston, WV 25311

I.D. Number **STATE USE ONLY** 039-02608

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

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(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and
(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: **1.** gasoline, used oil, or diesel fuel, and **2.** industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:
1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. **2.** Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached ☐

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
West Virginia Department of Highways

Street Address
1900 Washington Street, East

County
Kanawha

City: Charleston | State: WV | ZIP Code: 25305

Area Code: 304 | Phone Number: 348-0442

Type of Owner *(Mark all that apply ☒)*

- ☒ Current
- ☐ Former
- ☒ State or Local Gov't
- ☐ Federal Gov't (GSA facility I.D. no. _____)
- ☐ Private or Corporate
- ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
MCSTED

Street Address or State Road, as applicable
312 MICHIGAN AVE.

County
KANAWHA

City (nearest): CHARLESTON | State: WV | ZIP Code: 25311

Indicate number of tanks at this location: 2

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐): ALVIN HAMMONDS
Job Title: SUPERVISOR
Area Code: 304 | Phone Number: 348-3770

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative	Signature	Date Signed
C. C. Lewis, Director Highway Services	C. C. Lewis	5/7/86

CONTINUE ON REVERSE SIDE

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS *(Complete for each tank at this location.)*

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)	Tank No. 729-0036	Tank No. # 2	Tank No.	Tank No.	Tank No.
1. Status of Tank *(Mark all that apply ☒)* — Currently in Use	☒	☒	☐	☐	☐
Temporarily Out of Use	☐	☐	☐	☐	☐
Permanently Out of Use	☐	☐	☐	☐	☐
Brought into Use after 5/8/86	☐	☐	☐	☐	☐
2. Estimated Age (Years)	20	?			
3. Estimated Total Capacity (Gallons)	6000	500			
4. Material of Construction *(Mark one ☒)* — Steel	☒	☒	☐	☐	☐
Concrete	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other, Please Specify					
5. Internal Protection *(Mark all that apply ☒)* — Cathodic Protection	☐	☐	☐	☐	☐
Interior Lining (e.g., epoxy resins)	☐	☐	☐	☐	☐
None	☐	☐	☐	☐	☐
Unknown	☒	☒	☐	☐	☐
Other, Please Specify					
6. External Protection *(Mark all that apply ☒)* — Cathodic Protection	☐	☐	☐	☐	☐
Painted (e.g., asphaltic)	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic Coated	☐	☐	☐	☐	☐
None	☐	☐	☐	☐	☐
Unknown	☒	☒	☐	☐	☐
Other, Please Specify					
7. Piping *(Mark all that apply ☒)* — Bare Steel	☐	☐	☐	☐	☐
Galvanized Steel	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
Cathodically Protected	☐	☐	☐	☐	☐
Unknown	☒	☒	☐	☐	☐
Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume *(Mark all that apply ☒)* — **a. Empty**	☐	☐	☐	☐	☐
b. Petroleum					
Diesel	☐	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline (including alcohol blends)	☒	☐	☐	☐	☐
Used Oil	☐	☒	☐	☐	☐
Other, Please Specify					
c. Hazardous Substance	☐	☐	☐	☐	☐
Please Indicate Name of Principal CERCLA Substance					
OR					
Chemical Abstract Service (CAS) No.					
Mark box ☒ if tank stores a mixture of substances	☐	☐	☐	☐	☐
d. Unknown	☐	☐	☐	☐	☐
9. Additional Information (for tanks permanently taken out of service)					
a. Estimated date last used (mo/yr)	/	/	/	/	/
b. Estimated quantity of substance remaining (gal.)					
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)	☐	☐	☐	☐	☐

UST-2

White-Owner
Green-Operator
Canary-Charleston Office
Pink-Field Office

WV Division of Environmental Protection
Office of Waste Management
Underground Storage Tank Section

1356 Hansford Street
Charleston, WV 25301-1409
304-558-6371

NOTICE OF CLOSURE

To: Underground Storage Tank Owners and/or Operators

From: Underground Storage Tank Program
West Virginia Division of Environmental Protection

DATE OF NOTICE: 6/5/98 EXPIRATION DATE: 9/5/98

This office has received your notice of tank removal and/or closure in accordance with 280.71(a). Your site has been assigned closure number C-5743 9. Please refer to this number on any further correspondence concerning this closure. The tank closure is not to begin until the date has been scheduled with the undersigned inspector. All forms must be submitted to the UST Inspector within 30 days after the closure is completed.

If you should have any questions, please call Greg Henger at (304) 558-6371.

Owner/Operator Mailing Address: WVID# 2002051

WV Dept. of Transportation
1334 Smith St.
Charleston, WV 25301
contact - Craig Blakeman 558-3050

Location of tanks:

Central Motor Pool
212 California Ave.
Charleston, WV

Waiver of 30 days X Yes ____ No Date: June 18, 1998

Signed: [signature]

To be completed by inspector after closure:

number of USTs registered_____
number of USTs removed_____numbers of USTs closed in ground_____
number of USTs installed_____
Closure package is complete: _____yes _____no
notification form _____yes _____no
tank closure form _____yes _____no
lab analysis _____yes _____no
Leak No. assigned _____yes _____no Leak No._____
Material in package to be filled in leak file _____yes _____no
(material must be identified)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
Office of the District Engineer
District One
1334 Smith Street • Charleston, West Virginia 25301-1492 • 304/558-3001

Cecil H. Underwood
Governor

Samuel H. Beverage, P.E.
Commissioner of Highways

Thomas F. Badgett
Assistant Commissioner

June 5,1998

2002051

Mr. Greg Henger
WV Division of Environmental Protection
Office of Waste Management-UST Section
1356 Hansford Street
Charleston, West Virginia 25301

Re: Central Motor Pool, 01701 Facility
212 California Avenue, Charleston, West Virginia

Dear Mr. Henger:

The Division of Highways proposes to permanently close the Central Motor Pool 01701 Facility located at 212 California Avenue, in Charleston WV, as called for in a plan of the West Virginia State Capitol Complex to locate H.V.A.C. units on this site.

Closure numbers are requested for the removal of a 6000 gallon gasoline tank, a 4000 gallon gasoline tank, and a 500 gallon used oil tank at this site.

The Division of Highways requests a waiver of the thirty (30) day notification period as notice.

RECEIVED
COMPLIANCE ASSURANCE AND
EMERGENCY RESPONSE SECTION
JUN 11 1998
DEP OFFICE OF WASTE MANAGEMENT

DIVISION OF HIGHWAYS

The tentative schedule to begin removal of the subject tank is June 25th, 1998.

Should you need additional information, please contact Craig Blakeman at (304) 558-3050.

Very Truly Yours,

John W. Dawson
Acting District Engineer

JWD/km

P 4/2/99 ID# 2002051

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
Office of the District Engineer
District One
1334 Smith Street • Charleston, West Virginia 25301-1492 • 304/558-3001

Cecil H. Underwood
Governor

Samuel H. Beverage, P.E.
Commissioner of Highways

Thomas F. Badgett
Assistant Commissioner

June 5,1998

RECEIVED
COMPLIANCE ASSURANCE AND
EMERGENCY RESPONSE SECTION
APR 0 5 1999
DEP OFFICE OF WASTE MANAGEMENT

Mr. Greg Henger
WV Division of Environmental Protection
Office of Waste Management-UST Section
1356 Hansford Street
Charleston, West Virginia 25301

Re: Central Motor Pool, 01701 Facility
212 California Avenue, Charleston, West Virginia

Dear Mr. Henger:

The Division of Highways proposes to permanently close the Central Motor Pool 01701 Facility located at 212 California Avenue, in Charleston WV, as called for in a plan of the West Virginia State Capitol Complex to locate H.V.A.C. units on this site.

Closure numbers are requested for the removal of a 6000 gallon gasoline tank, a 4000 gallon gasoline tank, and a 500 gallon used oil tank at this site.

The Division of Highways requests a waiver of the thirty (30) day notification period as notice.

DIVISION OF HIGHWAYS

The tentative schedule to begin removal of the subject tank is June 25th, 1998.

Should you need additional information, please contact Craig Blakeman at (304) 558-3050.

Very Truly Yours,

John W. Dawson
Acting District Engineer

JWD/km

UST-21

White-Owner
Green-Operator
Canary-Charleston Office
Pink-Field Office

WV Division of Environmental Protection
Office of Waste Management
Underground Storage Tank Section

1356 Hansford Street
Charleston, WV 25301-1409
304-558-6371

NOTICE OF CLOSURE

To: Underground Storage Tank Owners and/or Operators

From: Underground Storage Tank Program
West Virginia Division of Environmental Protection

DATE OF NOTICE: 6/5/98 EXPIRATION DATE: 9/5/98

This office has received your notice of tank removal and/or closure in accordance with 280.71(a). Your site has been assigned closure number C- 5743 98 Please refer to this number on any further correspondence concerning this closure. The tank closure is not to begin until the date has been scheduled with the undersigned inspector. All forms must be submitted to the UST Inspector within 30 days after the closure is completed.

If you should have any questions, please call Greg Heager at (304) 558-6371.

Owner/Operator Mailing Address: WVID# 2002051

WV Dept. of Transportation
1334 Smith St.
Charleston, WV 25301
contact - Craig Blakeman 558-3050

Location of tanks:

Central Motor Pool
312 California Ave.
Charleston, WV

Waiver of 30 days X Yes ____ No Date: June 18, 1998

Signed: [signature]

To be completed by inspector after closure:

number of USTs registered 3
number of USTs removed 3 numbers of USTs closed in ground ____
number of USTs installed 6
Closure package is complete: ✓ yes ____ no
notification form ✓ yes ____ no
tank closure form ✓ yes ____ no
lab analysis ✓ yes ____ no
Leak No. assigned ____ yes ✓ no Leak No. ____
Material in package to be filled in leak file ____ yes ____ no
(material must be identified)

OMB NO. 2050-0068, Approval Expires 1/31/95

Notification for Underground Storage Tanks

STATE USE ONLY

State Agency Name and Address: WV Div. of Environmental Protection, Office of Waste Mgmt., UST Section, 1356 Hanford Street, Charleston, WV 25301

ID NUMBER 2002057

F.E.I.N.: No.

A. Date Entered Into Computer ____

B. Data Entry Clerk Initials ____

C. Owner Was Contacted to Clarify Responses. Comments ____

TYPE OF NOTIFICATION

☐ A. NEW FACILITY ☐ B. AMENDED ☑ C. CLOSURE

____ No. of tanks at facility ____ No. of continuation sheets attached

INSTRUCTIONS

Please type or print in ink all items except "signature" in section VIII. This form must be completed for each location containing underground storage tanks. If more than five (5) tanks are owned at this location, photocopy the following sheets, and staple continuation sheets to the form.

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances , that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, of the existence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. "Owner" means—

a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances; and

b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

c) if the State agency so requires, any facility that has undergone any changes to facility information or tank system status (only amended tank information needs to be included).

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. Gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situate upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Send completed forms to:

WV Division of Environmental Protection
Office of Waste Management
UST Section
1356 Hanford Street
Charleston, WV 25301

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation , but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use. 3. If the State requires notification of any amendments to facility send information to State agency immediately.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
WEST VIRGINIA DEPT. OF HIGHWAYS

Street Address
1334 SMITH STREET

CHARLESTON WV. 25301
City State ZIP Code

KANAWHA
County

(304) 558-7836
Phone Number (Include Area Code)

II. LOCATION OF TANK(S)

If required by State, give the geographic location of tanks by degrees, minutes, and seconds. Examples Lat. 42, 36, 12 N Long. 85, 24, 17W

Latitude 38° 20' 30" Longitude 81° 36' 60"

(if same as Section I, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
WV. DEPT. OF HIGHWAYS CENTRAL

Street Address (P.O. Box not acceptable)
MOTOR POOL 102 CALIFORNIA AVE.

CHARLESTON WV. 25301
City State Zip code

KANAWHA
County Municipality

EPA form 7530-1 (Revised 2-92)

III. TYPE OF OWNER	IV. INDIAN LANDS	
☐ Federal Government ☐ Commercial ☑ State Government ☐ Private ☐ Local Government	Tanks are located on land within an Indian Reservation or on other trust lands. ☐ Tanks are owned by native American nation, tribe, or individual. ☐	Tribe or Nation:

V. TYPE OF FACILITY

Select the Appropriate Facility Description

____ Gas Station	____ Railroad	____ Trucking/Transport
____ Petroleum Distributor	____ Federal - Non-Military	____ Utilities
____ Air Taxi (Airline)	____ Federal - Military	____ Residential
____ Aircraft Owner	____ Industrial	____ Farm
____ Auto Dealership	____ Contractor	✓ Other (Explain) W.V. DOH. CENTRAL MOTOR-POOL.

VI. CONTACT PERSON IN CHARGE OF TANKS

Name	Job Title	Address	Phone Number (Include Area Code)
CRAIG BLAKEMAN	VST COORDINATOR	1334 SMITH ST. CHAS. WV. 25301	558-7836

VII. FINANCIAL RESPONSIBILITY

I have met the financial responsibility requirements in accordance with 40 CFR Subpart H ☐

Check All that Apply

☑ Self Insurance	☐ Guarantee	☑ State Funds
☐ Commercial Insurance	☐ Surety Bond	☐ Trust Fund
☐ Risk Retention Group	☐ Letter of Credit	☐ Other Method Allowed Specify

VIII. CERTIFICATION (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true,accurate, and complete.

Name and official title of owner or owner's authorized representative (Print)	Signature	Date Signed
West Virginia Dept. of Highways	Craig L. Blakeman	07/09/98

EPA estimates public reporting burden for this form to average 30 minutes per response including time for reviewing instructions, gathering and maintaining the data needed and completing and reviewing the form. Send comments regarding this burden estimate to Chief, Information Policy Branch PM-223, U.S. Environmental Protection Agency, 401 M Street, Washington D.C. 20460, marked "Attention Desk Officer for EPA." This form amends the previous notification form as printed in 40 CFR Part 280, Appendix I. Previous editions of this notification form may be used while supplies last.

IX. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification Number	Tank No. 1	Tank No. 2	Tank No. 3	Tank No. ___	Tank No. ___
1. Status of Tank (mark only one) — Currently in Use					
Temporarily Out of Use (Remember to fill out section X.)					
Permanently Out of Use (Remember to fill out section X.)	✓	✓	✓		
Amendment of Information					
2. Date of Installation (mo./year)	UNKNOWN	1980	1992		
3. Estimated Total Capacity (gallons)	500	6000	4000		
4. Material of Construction (Mark all that apply)					
Asphalt Coated or Bare Steel	✓				
Cathodically Protected Steel		✓			
Epoxy Coated Steel					
Composite (Steel with Fiberglass)					
Fiberglass Reinforced Plastic			✓		
Lined Interior					
Double Walled					
Polyethylene Tank Jacket					
Concrete					
Excavation Liner					
Unknown					
Other, Please specify					
Has tank been repaired?					
5. Piping (Material) (Mark all that apply) — Bare Steel					
Galvanized Steel	✓				
Fiberglass Reinforced Plastic		✓	✓		
Copper					
Cathodically Protected					
Double Walled					
Secondary Containment					
Unknown					
Other, Please specify					
6. Piping (Type) (Mark all that apply)					
Suction: no valve at tank		✓	✓		
Suction: valve at tank					
Pressure					
Gravity Feed	✓				
Has piping been repaired?					

Tank Identification Number	Tank No. 1	Tank No. 2	Tank No. 3	Tank No. ___	Tank No. ___
7. Substance Currently or Last Stored In Greatest Quantity by Volume					
Gasoline		✓	✓		
Diesel					
Gasohol					
Kerosene					
Heating Oil					
Used Oil	✓				
Other, Please specify					
Hazardous Substance CERCLA name and/or, CAS number					
Mixture of Substances Please specify					
X. TANKS OUT OF USE, OR CHANGE IN SERVICE					
1. Closing of Tank					
A. Estimated date last used (mo./day/year)	1978?	6/23/98	6/23/98		
B. Estimate date tank closed (mo./day/year)	1978?	6/23/98	6/23/98		
C. Tank was removed from ground	✓	✓	✓		
D. Tank was closed in ground					
E. Tank filled with inert material					
Describe					
F. Change in service					
2. Site Assessment Completed	✓	✓	✓		
Evidence of a leak detected	YES	NO	NO		

UST-22 TANK CLOSURE REPORT (REV 5/94)

Complete one for each product

WV ID Number: 2002051 Closure Number: C5743-98 EPA I.D. No.(HW): ILD 984908202

Owner/Generator's Name: W.V. DEPT. OF HIGHWAYS Owner Phone No.: 558-3050

Owner/Generator's Address: WV. DEPT. OF HIGHWAYS 102 CALIFORNIA AVE. CHAS. WV.

Contractor's Name: BARNETTE BUILDERS WV Cert. Number: AB053

Contractor's Phone: 1-304-653-8532

Tank Number/s (from notification form): ONE

I. Tank Closure: Date: 6/25/98

A. Tank:

Vapor purging methods: USED OIL TANK - NO VAPORS PRESENT
Tank cleaning methods: SCRAPED & WIPED INTERIOR WALLS
Tanks Destination Name: WV. DIV. OF HIGHWAYS EQUIPMENT DIVISION
Site Address: BUCKHANNON, WV.
Tank Cleaned at destination: Yes ___ No ✓ : If no where: CALIFORNIA AVE.
Future use of the tank: JUNK
Transporter name: WV. DEPT. OF HIGHWAYS ID: ___

B. Liquid removed from tank:
Type: WATER - USED OIL Amount in gallons: 500

Reused ___ Recycled ✓	Hazardous Waste(HW) ___ Non-Hazardous ✓
How Reused ___	Waste Number(HW): ___
Recycling Facility: SAFETY-KLEEN	Disposal Method: PUMPED BY SAFTEY-KLEEN CORP.
Address: 105 HARRIS DR. POCA, WV.	Designated Facility Name: SAFETY-KLEEN CORP.
*provide receipt from facility.	Address: 105 HARRIS DRIVE POCA, WV.
	Transporter Name: JEFF GLASBELL
	Transporter ID(HW): ILD 984-908202

C. Solids & Tank Bottoms:
Type: OIL SLUDGE Amount: 2 GALLONS

Hazardous Waste (HW): ___ Non-Hazardous: ✓
Waste Number(HW): ___ Disposal Method: ___
Designated facility name: SAFETY KLEEN CORP.
Site Address: 105 HARRIS DRIVE. POCA WV.
Transporter name: ___ ID(HW): 984-908202

II. Piping Closure: Date: 6/26/98

A. Length of piping between tank & product dispenser: 10FT.
B. Piping closure method: REMOVED FROM GROUND

III. Tank Closure in Place: Date: N/A

A. Type of inert material used to fill tank: N/A

UST-22 TANK CLOSURE REPORT (REV 5/94)

Complete one for each product

WV ID Number:_____ Closure Number:_____ EPA I.D. No.(HW):_____

Owner/Generator's Name:_____ Owner Phone No.:_____

Owner/Generator's Address:_____

Contractor's Name:_____ WV Cert. Number:_____

Contractor's Phone:_____

Tank Number/s (from notification form):_____

I. Tank Closure: Date:_____

A. Tank:

Vapor purging methods:_____
Tank cleaning methods:_____
Tanks Destination Name:_____
Site Address:_____
Tank Cleaned at destination: Yes___ No___:If no where:_____
Future use of the tank:_____
Transporter name:_____ ID:_____

B. Liquid removed from tank:
Type:_____ Amount in gallons:_____

Reused____ Recycled____
How Reused_____
Recycling Facility:
_____
Address:_____

*provide receipt from facility.

Hazardous Waste(HW)____ Non-Hazardous____
Waste Number(HW):_____
Disposal Method:_____
Designated Facility Name:_____
Address:_____
Transporter Name:_____
Transporter ID(HW):_____

C. Solids & Tank Bottoms:
Type:_____ Amount:_____

Hazardous Waste (HW):_____ Non-Hazardous:_____
Waste Number(HW):_____ Disposal Method:_____
Designated facility name:_____
Site Address:_____
Transporter name:_____ ID(HW):_____

II. Piping Closure: Date:_____

A. Length of piping between tank & product dispenser:_____
B. Piping closure method:_____

III. Tank Closure in Place: Date:_____

A. Type of inert material used to fill tank:_____

IV. Site Assessment: Date: 6/25/98

A. Free product present: Yes _____ No ✓

B. Sampling: Date: 6/25/98

Type of Sampling device: Soils _____ Water _____

Type of sampling container: Soils 402. JAR Water _____

Composite sample: Yes ✓ No _____

C. Analysis:

Lab Name: CTYE ENVIRONMENTAL SERVICES INC.

Date Analyzed: 6/26/98 *Lab QA Plan should be available upon request A copy of the orginial sample report as received from the lab is requested in accordance with 280.34.

D. Provide a diagram of the sample location and depths.

Certification:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inqiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Signature of Contractor:	Certification No.:	Date Signed:
Larry L. Robertson WVDOH	AB045	06/25/98
Signature of UST Owner: West Virginia Pub. of Highways		Date Signed: 06/25/98

Return this form to the UST Inspector at the DEP District Office for the county where the tanks are located.

Form ME-115
2-1-91

FUEL STORAGE TANK FIELD REPORT

DESCRIPTION - (GAS) ✓ (DIESEL) _____ ED# 729-296

LOCATION - DISTRICT One COUNTY Kanawha

PURCHASED FROM N/A DATE RECEIVED 1980

ADDRESS California Avenue

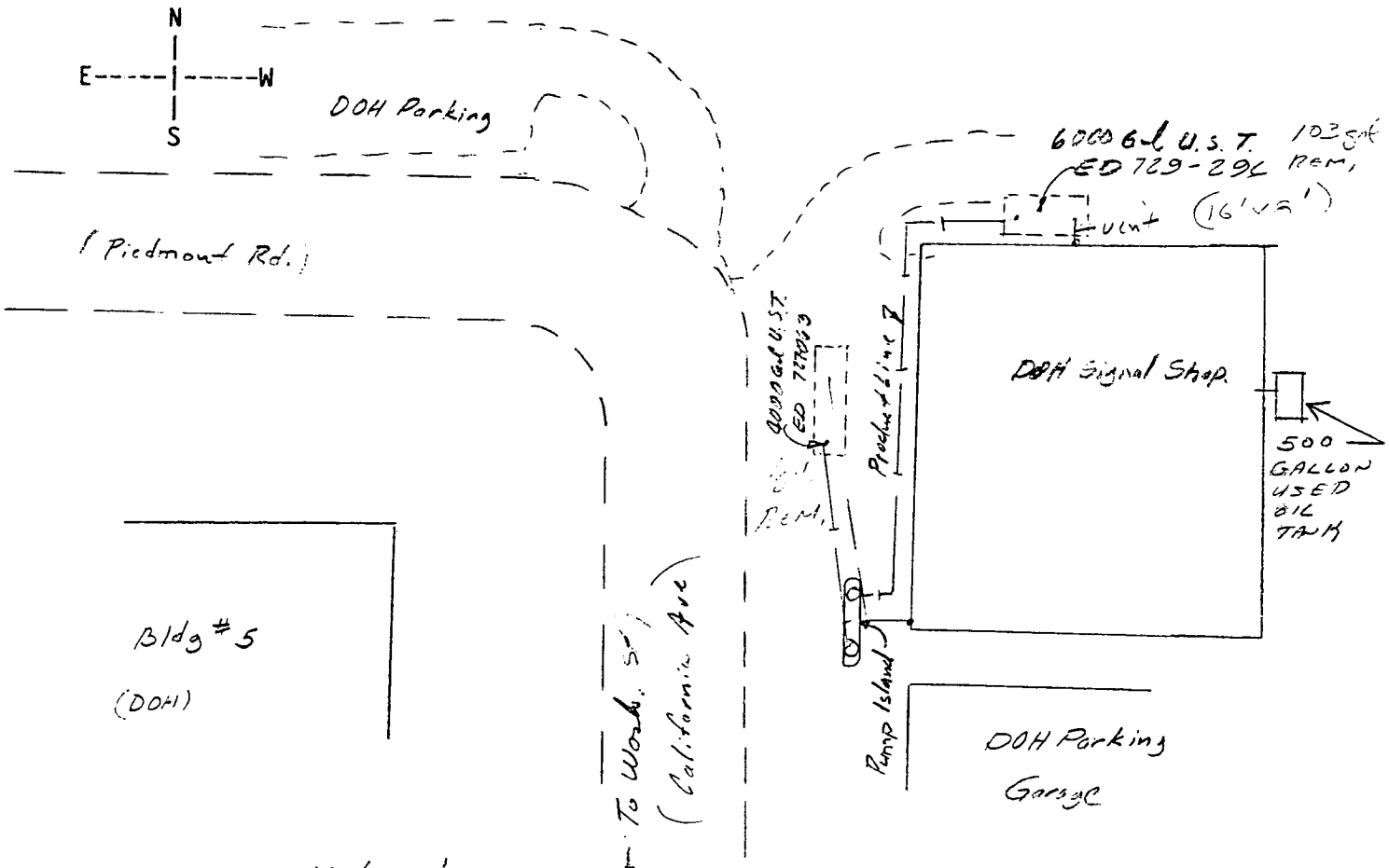
MANUFACTURER N/A TYPE OF TANK - STEEL ✓ FIBERGLASS _____

PURCHASE ORDER # N/A ABOVE GROUND _____ UNDERGROUND ✓

COST N/A CAPACITY 6000 HEIGHT 8' Round WIDTH _____ LENGTH 16' (Assumed)

COMMENTS _____

DESCRIPTION OF LOCATION Capitol Complex Fueling Station



INSPECTED BY: Mike Jones TITLE: Dist. One Planning Eng.

ORGANIZATION: 0180 DATE: 2/23/92

UST-22 TANK CLOSURE REPORT (REV 5/94)

Complete one for each product

WV ID Number: 2002051 Closure Number: CS743-98 EPA I.D. No.(HW): _____

Owner/Generator's Name: WV. DEPT. OF HIGHWAYS Owner Phone No.: 558-3050

Owner/Generator's Address: WV. DEPT. OF HIGHWAYS - 102 CALIFORNIA AVE. CHAS. WV.

Contractor's Name: BARNETTE Buildings WV Cert. Number: AB053

Contractor's Phone: 1-304-653-8532

Tank Number/s (from notification form): Two

I. Tank Closure: Date: 6/25/98

A. Tank:

Vapor purging methods: VENTURI - COMPRESSED AIR
Tank cleaning methods: SCRAPED BY HAND - INTERIOR WALLS
Tanks Destination Name: WV. DIVISION OF HIGHWAYS EQUIPMENT DIV.
Site Address: BUCKHANNON, WV.
Tank Cleaned at destination: Yes ___ No ✓: If no where: CALIFORNIA AVE
Future use of the tank: JUNK
Transporter name: WV. DEPT. OF HIGHWAYS ID: _____

B. Liquid removed from tank:
Type: GASOLINE Amount in gallons: 40

Reused ✓ Recycled ___
How Reused _____
Recycling Facility: _____
Address: _____
*provide receipt from facility.

Hazardous Waste(HW) ___ Non-Hazardous ___
Waste Number(HW): _____
Disposal Method: ~~SEALED DRUM~~
Designated Facility Name: ~~SAFETY KLEEN~~ CORP.
Address: ~~105 HARRIS DRIVE DOCA WV.~~
Transporter Name: ~~SAFETY-KLEEN~~
Transporter ID(HW): ~~FED 984-908202~~

C. Solids & Tank Bottoms:
Type: SLUDGE / RUST Amount: 15 GALLONS

Hazardous Waste (HW): ✓ Non-Hazardous: _____
Waste Number(HW): _____ Disposal Method: SEALED DRUM
Designated facility name: SAFETY-KLEEN
Site Address: 105 HARRIS DRIVE DOCA, WV.
Transporter name: SAFETY-KLEEN ID(HW): 984-908202

II. Piping Closure: Date: 6/26/98

A. Length of piping between tank & product dispenser: 35'
B. Piping closure method: REMOVED FROM GROUND

III. Tank Closure in Place: Date: N/A

A. Type of inert material used to fill tank: N/A

IV. Site Assessment: Date: _____

A. Free product present: Yes _____ No ✓
B. Sampling: Date: 8-25-98
Type of Sampling device: Soils _____ Water N/A
Type of sampling container: Soils 4oz. JAR Water _____
Composite sample: Yes ✓ No _____
C. Analysis:
Lab Name: CTEE ENVIRONMENTAL SERVICES INC.
Date Analyzed: _____ *Lab QA Plan should be available upon request
A copy of the orginial sample report as received from the lab is requested in accordance with 280.34.
D. Provide a diagram of the sample location and depths.

Certification:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inqiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Signature of Contractor:	Certification No.:	Date Signed:
[signature]	AB045	07/09/98
Signature of UST Owner: West Virginia Dept. of Highways		Date Signed: 07/09/98

Return this form to the UST Inspector at the DEP District Office for the county where the tanks are located.

Form ME-115
2-1-91

FUEL STORAGE TANK FIELD REPORT

DESCRIPTION - (GAS) ✓ (DIESEL) _____ ED# 729-296

LOCATION - DISTRICT Dac COUNTY Kanawha

PURCHASED FROM N/A DATE RECEIVED 1980

ADDRESS California Avenue

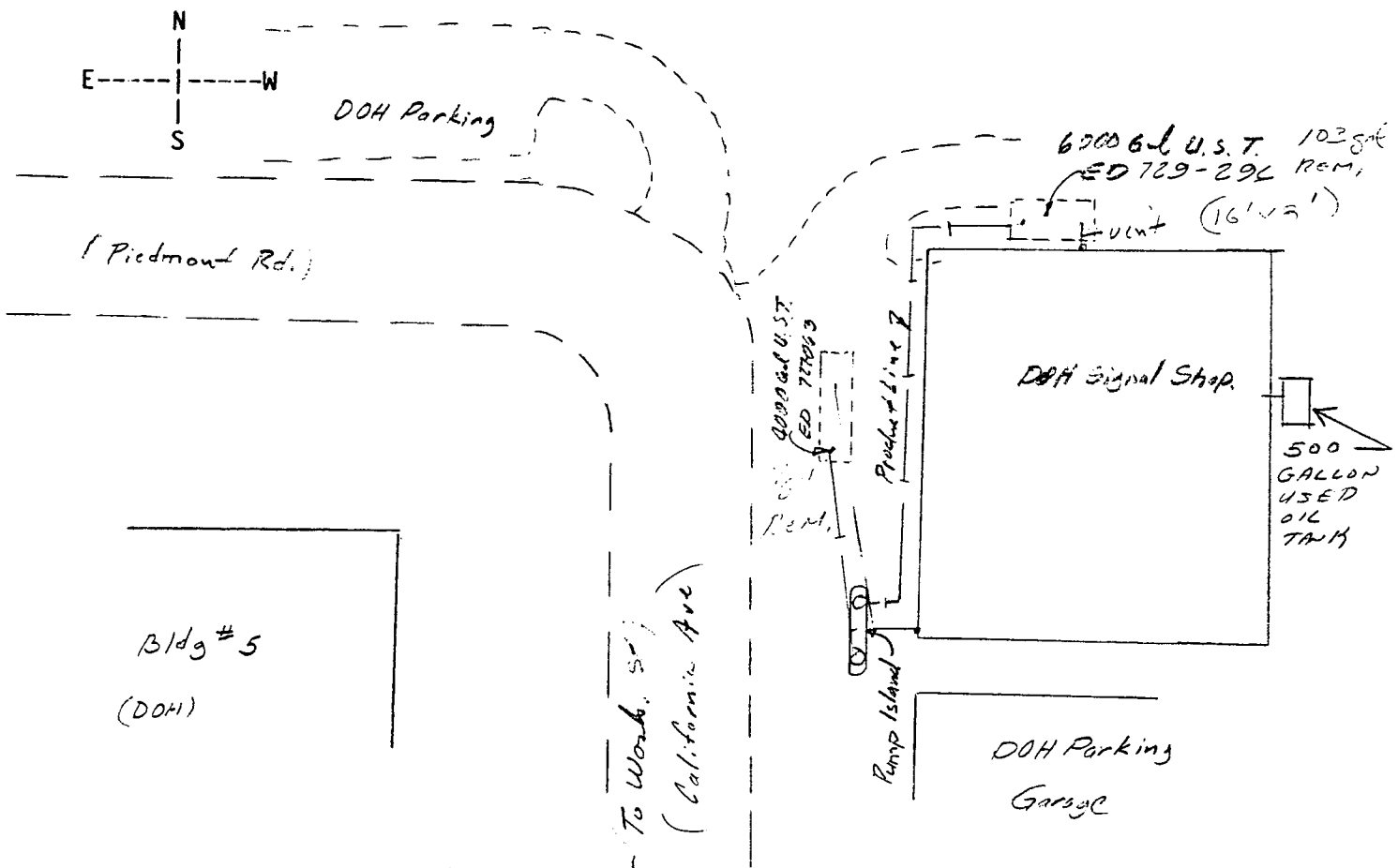
MANUFACTURER N/A TYPE OF TANK - STEEL ✓ FIBERGLASS _____

PURCHASE ORDER # N/A ABOVE GROUND _____ UNDERGROUND ✓

COST N/A CAPACITY 6000 HEIGHT 6' Round WIDTH _____ LENGTH 16' (Assumed)

COMMENTS _____

DESCRIPTION OF LOCATION Capitol Complex Fueling Station



INSPECTED BY: Mike Jones TITLE: Dist. Dac Planning Eng.

ORGANIZATION: 0180 DATE: 2/23/92

UST-22 TANK CLOSURE REPORT (REV 5/94)

Complete one for each product

WV ID Number: 2002051 Closure Number: C574398 EPA I.D. No.(HW): _____

Owner/Generator's Name: WV. DEPT. OF HIGHWAYS Owner Phone No.: 558-3050

Owner/Generator's Address: WV DEPT OF HIGHWAYS - 102 CALIFORNIA AVE.

Contractor's Name: BARNETTE BUILDERS WV Cert. Number: AB053

Contractor's Phone: 1-304-653-8532 CRAIG BLAKEMAN AB045 1-304-558-3050

Tank Number/s (from notification form): THREE

I. Tank Closure: Date: 6/25/98

A. Tank:

Vapor purging methods: VENTURI - COMPRESSED AIR
Tank cleaning methods: SCRAPED BY HAND ALL INTERIOR WALLS
Tanks Destination Name: WV. DEPT. OF HIGHWAYS EQUIPMENT DIV.
Site Address: BUCKHANNON WV.
Tank Cleaned at destination: Yes ___ No X : If no where: CALIFORNIA AVE
Future use of the tank: JUNK
Transporter name: WV. DEPT. OF HIGHWAYS ID: _____

B. Liquid removed from tank:
Type: GASOLINE Amount in gallons: 30

Reused ✓ Recycled ___
How Reused _____
Recycling Facility: _____
Address: _____
*provide receipt from facility.

Hazardous Waste(HW) ___ Non-Hazardous ___
Waste Number(HW): _____
Disposal Method: _____
Designated Facility Name: _____
Address: _____
Transporter Name: _____
Transporter ID(HW): _____

C. Solids & Tank Bottoms:
Type: SLUDGE Amount: 22 GALLONS

Hazardous Waste (HW): ✓ Non-Hazardous: _____
Waste Number(HW): _____ Disposal Method: SEALED DRUMS
Designated facility name: SAFETY KLEEN
Site Address: 105 HARRIS DRIVE POCA WV.
Transporter name: SAFETY KLEEN ID(HW): 784-908202

II. Piping Closure: Date: 6/26/98

A. Length of piping between tank & product dispenser: 15 FT
B. Piping closure method: REMOVED FROM GROUND

III. Tank Closure in Place: Date: N/A

A. Type of inert material used to fill tank: N/A

IV. Site Assessment: Date: _____

A. Free product present: Yes _____ No ✓

B. Sampling: Date: _____

Type of Sampling device: Soils _____ Water _____

Type of sampling container: Soils _____ Water _____

Composite sample: Yes ✓ No _____

C. Analysis:

Lab Name: CT&E

Date Analyzed: 06/26/98 *Lab QA Plan should be available upon request

A copy of the orginial sample report as received from the lab is requested in accordance with 280.34.

D. Provide a diagram of the sample location and depths.

Certification:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inqiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Signature of Contractor:	Certification No.:	Date Signed:
Gary Blackburn	AB045	07/09/98
Signature of UST Owner: West Virginia Exp. of Highways		Date Signed: 07/09/98

Return this form to the UST Inspector at the DEP District Office for the county where the tanks are located.

Form ME-115
2-1-91

FUEL STORAGE TANK FIELD REPORT

DESCRIPTION - (GAS) ✓ (DIESEL) _____ ED# 729-296

LOCATION - DISTRICT One COUNTY Kanawha

PURCHASED FROM N/A DATE RECEIVED 1980

ADDRESS California Avenue

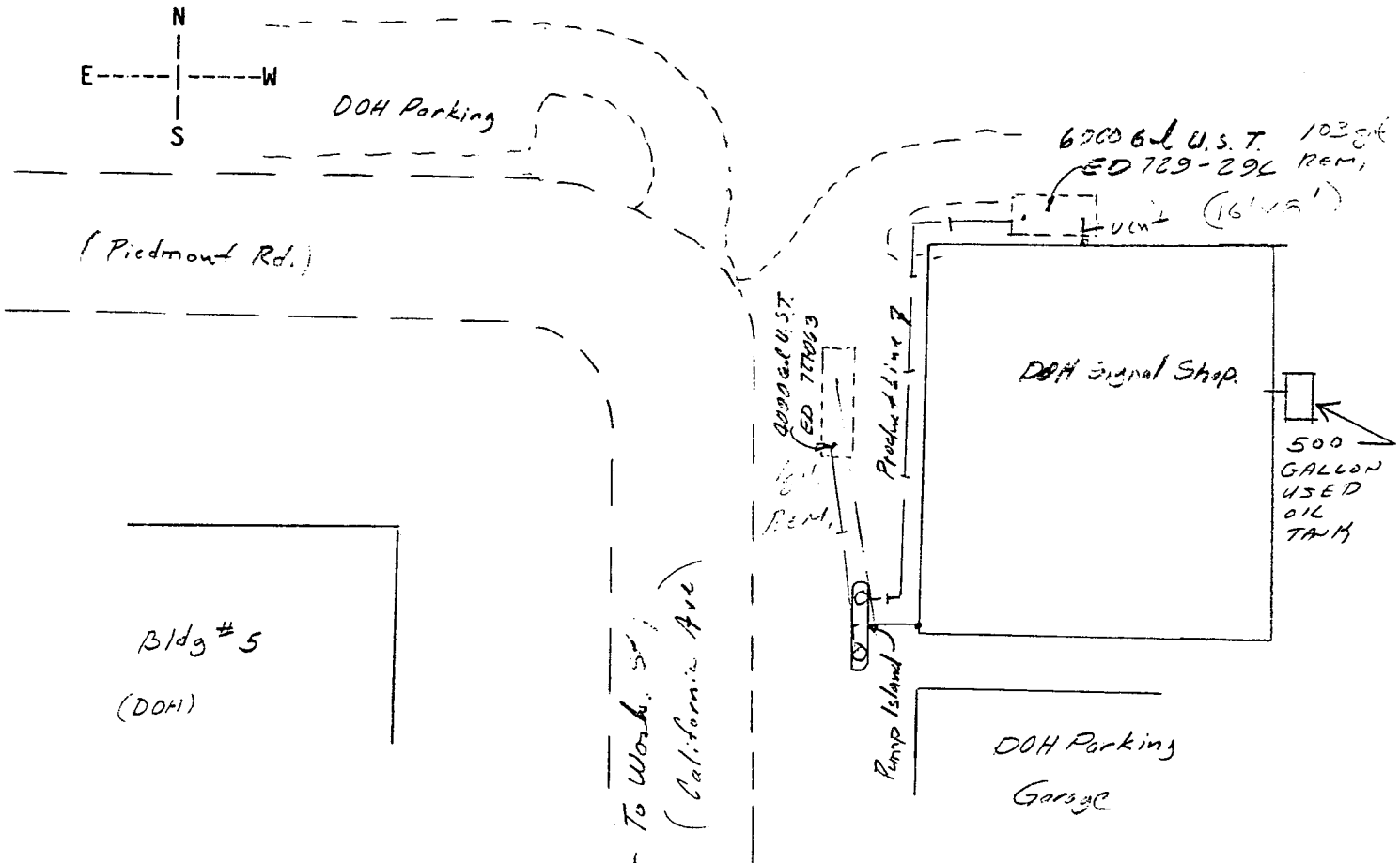
MANUFACTURER N/A TYPE OF TANK - STEEL ✓ FIBERGLASS _____

PURCHASE ORDER # N/A ABOVE GROUND _____ UNDERGROUND ✓

COST N/A CAPACITY 6000 HEIGHT Round 8' WIDTH _____ LENGTH 16' (Assumed)

COMMENTS _____

DESCRIPTION OF LOCATION Capitol Complex Fueling Station



INSPECTED BY: Mike Jones TITLE: Dist. One Planning Eng.

ORGANIZATION: 0180 DATE: 2/23/92

Underground Storage Tank
Cleaning Certificate

This certificate confirms that on the 25 day of June 1998, a crew from Barnett Builders ConstructionGroup, Inc. degased, pumped, purged, and cleaned the interior in accordance with API standard 2015 the following tanks:

Location:

Site	West virginia - DOH, District - 1
Address	inter. Calf. Ave and Piedmont Rd
City	Charleston
State	WVA Zip 25301

WV ID Number: 2002051 Closure Number: C-5743-98

	Tank Number	Size Gallons	Contents	Composition (fiberglass or steel)
1.	1	6,000	Gasoline	Steel
2.	2	500	Used Oil	Steel
3.	3	4,000	Gasoline	Fiberglass
4.				
5.				

Persons accepting the above tanks attest that said tanks will not be used for storage of potable water, underground storage of fuels, and or storage of foods for human or animal consumption.

Craig L. Blakeman

Barnett Builders Construction Group, Inc.
West Virginia Contractors License WV001549
EPA Certification Number AB053

Roger L Shy

Signature

6/25/98

Date

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-001 Respectfully Submitted:

CAL 6 4000 GAL UST PRODUCT LINE COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		ND	2.0	mg/kg	SW8015	07/01/98 18:36 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		73	----	% REC	SW8015	07/01/98 18:36 RW

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
1258 Greenbrier Street, **Charleston, WV 25311-1002** – (304) 346-0725 Fax: (304) 346-0761
5712 Erdman Ave., **Baltimore, MD 21205-3598** – Tel: (410) 483-2200 Fax: (410) 483-2206
4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E ENVIRONMENTAL SERVICES INC.

TERMS AND CONDITIONS

By accepting a proposal or price quotation, placing a work request, submitting a sample for testing, or using a report from CT&E Environmental Services Inc. (CT&E ESI) the Client agrees to the following terms and conditions:

SCOPE OF SERVICES

CT&E ESI performs testing services on samples submitted to or collected by CT&E ESI using environmental testing industry accepted protocols, practices and standards and as requested by Client. CT&E ESI provides a written report of analytical results.

Turn around time (TAT) is measured in business days (weekends and holidays excluded) and begins the day after the sample arrives at the laboratory. CT&E ESI's typical TAT is 10 business days. Expedited service may be available with advance consultation.

DUTIES OF CUSTOMER

Client will submit written work requests to CT&E ESI stating scope and timing of work, testing criteria and any other information necessary for CT&E ESI to perform the work. Client will designate a representative to transmit instructions, receive information, and make decisions.

Samples delivered to CT&E ESI must be preceded or accompanied by written disclosure of any hazardous substances known or suspected by Client. Samples suspected of containing a hazardous substance must be packaged, labeled, transported and delivered in accordance with applicable laws, with safety of utmost concern.

CT&E ESI reserves the absolute right to refuse delivery or revoke acceptance of any sample which in the sole judgment of CT&E ESI is of unsuitable volume, arrives in a leaking or damaged container, or may pose a risk in handling, transport or processing or for any other reason, whether or not due to the presence in the sample of any hazardous substance and whether or not such presence has been disclosed to CT&E ESI by the Client.

PAYMENT TERMS & PRICE

For clients with approved credit, CT&E ESI will bill monthly for work completed during the previous month. Client agrees to pay invoices within thirty (30)days after receipt. Client agrees to pay a late charge on past due invoices at one and one-half percent (1.5%) per month (eighteen percent (18%) per annum (or such lower rate required by law. Client agrees to pay all expenses incurred by CT&E ESI, including attorney fees and court costs, to collect any past due amounts.

Fees are per CT&E ESI's current price list and are subject to change without prior notice. Fees include sample and shipping containers. CT&E ESI requires at least 3 business days notice to prepare and ship sample containers. Non-expedited shipping costs to the client are assumed by CT&E ESI. Rush delivery shipping charges are assumed by the Client. Results are delivered by mail or with special arrangements verbally, by fax or computer disk. Surcharges for rush analysis are: 1-2 Day TAT = 2 X Standard Fee; 3-5 Day TAT = 1.5 X Standard Fee.

LIMITED WARRANTY

CT&E ESI shall perform all services with reasonable care and diligence normal to the environmental testing industry. CT&E ESI's sole obligation hereunder shall be to re-perform services which are materially deficient without charge, so long as such deficiencies are reported in writing to CT&E ESI within thirty (30) days after the discovery thereof, but in no event later than one (1) year from the performance of the services by CT&E ESI.

By their very nature sampling, testing, and other CT&E ESI services are limited in scope and subject to expected measurement variability and possible interferences in the measurement process caused by the sample matrix. CT&E ESI makes no warranty that the tested sample is representative of the source from which the sample was taken or that any particular analysis can be performed on a particular sample. CT&E ESI may on occasion utilize subcontractors.

CT&E ESI MAKES NO EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE ON THE SERVICES OF CT&E ESI. IN NO EVENT SHALL CT&E ESI BE LIABLE FOR ANY INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES. NOR SHALL CT&E ESI BE LIABLE IN ANY EVENT, INCLUDING ITS OBLIGATION TO RE-PERFORM, FOR ANY LOSSES, DAMAGES OR CLAIMS IN EXCESS OF THE AMOUNT PAIDTO CT&E ESI FOR THE SERVICES HEREUNDER.

CONFIDENTIALITY

CT&E ESI shall keep documents and information related to the Client confidential and will not disclose any such information to third parties without Client permission except in response to legal process after giving a copy of such process to Client.

FORCE MAJEURE

CT&E ESI shall have no liability for nonperformance caused in whole or in part by causes beyond our reasonable control. Such causes include but are not limited to Acts of God, civil unrest and war, labor unrest and strikes, equipment failures, acts of authorities, or delays in transportation, mail or delivery services.

RECORDS/SAMPLE RETENTION

CT&E ESI will retain copies of data and reports for five years after which such documents will be destroyed. If Client requests additional copies of reports or data during the retention period, an additional charge will apply for the preparation and delivery of such reports.

Samples known or suspected to contain hazardous substances or determined by CT&E ESI to be incompatible with existing waste streams may be returned at Client's cost, to the Client upon completion of testing. Samples not destroyed in testing and not returned to the Client will be retained for 30 days after submittal of the final data report, and thereafter disposed of by CT&E ESI. Samples can be retained beyond 30 days at a monthly storage charge payable in advance.

CHOICE OF LAW

The agreement between Client and CT&E ESI shall be interpreted under the laws of the state in which CT&E ESI receives the samples.

AMENDMENT AND CONFLICTING PROVISIONS

These Terms and Conditions may be amended only by written agreement of CT&E ESI. These Terms and Conditions shall override conflicting provisions contained in Client purchase order or other standard form documents.

CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-001

Respectfully Submitted:

CAL 6 4000 GAL UST PRODUCT LINE COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 12:23 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		90	------	% REC	SW8015	06/30/98 12:23 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 12:23 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 12:23 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 12:23 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 12:23 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		101	------	% REC	SW8021	06/30/98 12:23 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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5712 Erdman Ave., **Baltimore, MD 21205-3598** – Tel: (410) 483-2200 Fax: (410) 483-2206
4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-001

Respectfully Submitted:

CAL 6 4000 GAL UST PRODUCT LINE COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-001

Respectfully Submitted:

CAL 6 4000 GAL UST PRODUCT LINE COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 15:19 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-001

Respectfully Submitted:

CAL 6 4000 GAL UST PRODUCT LINE COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

SPIKED SAMPLE ANALYSIS SUMMARY REPORT
FOR TCLP METALS

PARAMETER	CAS NO.	RESULT	SPIKE LEVEL	UNITS	PERCENT RECOVERY
QCSPIKE					
Lead [Pb]	7439-92-1	1.7	2.0	mg/L	85 %

All spike results are corrected for the sample background.

$$\text{Percent Recovery} = \frac{\text{BACKGROUND CORRECTED SPIKE RESULT}}{\text{SPIKE LEVEL}} \times 100$$

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-002

Respectfully Submitted:

J. M. Wright

071098 0850

CAL 6 4000 GAL UST NSEW WALL COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 10:00
Date Received 06/26/98

Sampled by CLIENT

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		ND	2.0	mg/kg	SW8015	07/01/98 19:10 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		63	----	% REC	SW8015	07/01/98 19:10 RW

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-002

Respectfully Submitted:

CAL 6 4000 GAL UST NSEW WALL COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 10:00
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 12:46 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		90	------	% REC	SW8015	06/30/98 12:46 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 12:46 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 12:46 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 12:46 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 12:46 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		102	------	% REC	SW8021	06/30/98 12:46 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-002

Respectfully Submitted:

L. M. Wright

CAL 6 4000 GAL UST NSEW WALL COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 10:00
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-002

Respectfully Submitted:

CAL 6 4000 GAL UST NSEW WALL COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 10:00
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 15:29 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-003

Respectfully Submitted:

CAL 8 4000 GAL UST EXCAV. BOTTOM COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		ND	2.0	mg/kg	SW8015	07/01/98 19:44 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		60	----	% REC	SW8015	07/01/98 19:44 RW

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-003

Respectfully Submitted:

CAL 8 4000 GAL UST EXCAV. BOTTOM COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 13:10 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		88	------	% REC	SW8015	06/30/98 13:10 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 13:10 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 13:10 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 13:10 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 13:10 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		100	-----	% REC	SW8021	06/30/98 13:10 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-003

Respectfully Submitted:

J. M. Wright

071098 0850

CAL 8 4000 GAL UST EXCAV. BOTTOM COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0926-003

Respectfully Submitted:

J. M. Wright

071098 0850

CAL 8 4000 GAL UST EXCAV. BOTTOM COMP
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:10
Date Received 06/26/98

Sampled by CLIENT

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 15:33 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

6-926-13

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: West Virginia Dept. of Highways.
CONTACT: CRAIG BLAKEMAN PHONE NO: ( )
PROJECT: UST CLOSURE SITE: CALIFORNIA AVE
REPORTS TO: 834 SMITH ST. 25301 CHARLESTON, W.V. FAX NO: ( )
INVOICE TO: SAME P.O. NUMBER:

CT&E Reference:

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C=COMP G=GRAB	Preservatives Used	Analysis Required (3) TPH (GRO-DRO)	BTEX	TCLP LEAD	REMARKS
CAL 6	4000GAL UST PRODUCT LINE	6/26	1:00		1	C		/	/	/	
CAL 7	4000GAL UST NEAR WALL	6/26	10:00		1	C		/	/	/	
CAL 8	4000GAL UST EXCAVATION BOTTOM	6/26	1:10		1	C		/	/	/	

(5)

Collected / Relinquished By: (1)	Date	Time	Received By:
[signature]	6/26/98	4:35	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/26	Time 430	Received For Laboratory By: [signature]

(4)

Shipping Carrier:
Shipping Ticket No:
Samples Received Cold? (Circle) YES NO
Temperature °C: 13
Data Deliverables Required
Level I Level II Level III
Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:

1258 Greenbrier Street **Charleston, WV 25311** Tel: (304) 346-0725 Fax: (304) 346-0761
White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

6-926-13

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: West Virginia Dept. of Highways.
CONTACT: CHRIS BLAKEMAN PHONE NO: ( )
PROJECT: UST CLOSURE SITE: CALIFORNIA AVE
REPORTS TO: 334 SMITH ST. 2530' CHARLESTON, W.V. FAX NO: ( )
INVOICE TO: SAME P.O. NUMBER:

CT&E Reference:

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C=COMP G=GRAB	Preservatives Used	Analysis Required (3) TPH (GRO DRO)	BTEX	TCLP LEAD	REMARKS
CAL 6	4000GAL UST PRODUCT LINE	6/26	1:10		1	C		✓	✓	✓	
CAL 7	4000GAL UST UNDERNEATH	6/26	10:00		1	C		✓	✓	✓	
CAL 8	4000GAL UST EXCAVATION BOTTOM	6/26	1:10		1	C		✓	✓	✓	

(5)

Collected / Relinquished By: (1)	Date	Time	Received By:
[signature]	6/26/98	4:35	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/26	Time 430	Received For Laboratory By: [signature]

(4)

Shipping Carrier:	Samples Received Cold? (Circle) YES NO
Shipping Ticket No:	Temperature °C: 13
Data Deliverables Required Level I Level II Level III	Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:	

1258 Greenbrier Street **Charleston, WV 25311** Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-001

Respectfully Submitted:

CAL 3 600 GAL UST NSEW WALL COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		11	2.0	mg/kg	SW8015	07/01/98 20:19 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		75	----	% REC	SW8015	07/01/98 20:19 RW

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-001

Respectfully Submitted:

CAL 3 600 GAL UST NSEW WALL COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 11:12 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		90	------	% REC	SW8015	06/30/98 11:12 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 11:12 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 11:12 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 11:12 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 11:12 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		101	------	% REC	SW8021	06/30/98 11:12 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-001 Respectfully Submitted:

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UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK	DATE/TIME/ANALYST
Sample Phase		
Solid	YES	
Sludge		
Liquid		
Suspended Solids,%		
>0.5	YES	
<0.5		
Sample Treatment		
Extracted,Filtered, and Analyzed	YES	
Filtered, and Analyzed		
Analyzed		
Bottle Extraction Date & Analyst	---	SW1311 07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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Laboratory Number 298-06-0925-001

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UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:10
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 14:51 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-001

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UST CLOSURE CALIFORNIA AVE.

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Date Received 06/26/98

Sampled by CLIENT

071098 0850

SPIKED SAMPLE ANALYSIS SUMMARY REPORT
FOR TCLP METALS

PARAMETER	CAS NO.	RESULT	SPIKE LEVEL	UNITS	PERCENT RECOVERY
QCSPIKE					
Lead [Pb]	7439-92-1	1.9	2.0	mg/L	95 %

All spike results are corrected for the sample background.

$$\text{Percent Recovery} = \frac{\text{BACKGROUND CORRECTED SPIKE RESULT}}{\text{SPIKE LEVEL}} \times 100$$

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-002

Respectfully Submitted:

CAL 4 600 GAL UST BOTTOM EXC. COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:20
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		ND	2.0	mg/kg	SW8015	07/01/98 20:53 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		62	----	% REC	SW8015	07/01/98 20:53 RW

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-002 Respectfully Submitted:

CAL 4 600 GAL UST BOTTOM EXC. COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:20
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 11:36 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		90	------	% REC	SW8015	06/30/98 11:36 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 11:36 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 11:36 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 11:36 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 11:36 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		101	------	% REC	SW8021	06/30/98 11:36 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-002

Respectfully Submitted:

CAL 4 600 GAL UST BOTTOM EXC. COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 9:20
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-002

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Date Sampled 06/26/98 9:20
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	0.80	0.10	SW6010	5.0	07/08/98 15:01 MA

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-003

Respectfully Submitted:

CAL 4 600 GAL UST PRODUCT LINE COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:05
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		4.7	2.0	mg/kg	SW8015	07/01/98 21:27 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		56	----	% REC	SW8015	07/01/98 21:27 RW

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-003

Respectfully Submitted:

CAL 4 600 GAL UST PRODUCT LINE COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:05
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 11:59 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		90	------	% REC	SW8015	06/30/98 11:59 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 11:59 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 11:59 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 11:59 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 11:59 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		101	-----	% REC	SW8021	06/30/98 11:59 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.
Laboratory Division

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Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0925-003

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CAL 4 600 GAL UST PRODUCT LINE COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/26/98 13:05
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071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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Laboratory Number 298-06-0925-003

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071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 15:15 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

6-925-43

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: WV. DIVISON OF HIGHWAYS

CONTACT: CRAIG BLAKEMAN PHONE NO: (304) 558-2050

PROJECT: UST CLOSURE SITE: CALIFORNIA AVE.

REPORTS TO: WVDOH
1334 SMITH ST.
CHARLESTON WV 25312 FAX NO: ( )

INVOICE TO:
SAME

P.O. NUMBER:

CT&E Reference:

PAGE _____ OF _____

(2)

LAB NO:	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C= COMP G= GRAB	Preservatives Used	Analysis Required (3) TPH(GRO-DRO)	BTEX	TCLP LEAD	REMARKS
CAL 3	6000GAL UST NEW WALL	6/26	9:10		1	C		1	1	1	
CAL 4	6000GAL UST BOTTOM EX.	6/26	9:20		1	C		1	1	1	
CAL 5	6000GAL UST PRODUCT LINE	6/26	1:05								

(5)

Collected / Relinquished By: (1)	Date	Time	Received By:
Craig Blakeman	6/26 58	4:35	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/26	Time 6/26 4:30	Received For Laboratory By:

(4)

Shipping Carrier:	Samples Received Cold? (Circle) YES NO
Shipping Ticket No:	Temperature °C: 13
Data Deliverables Required Level I Level II Level III	Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:	

Safety-Kleen
Elgin, Illinois 60123-7857
CUSTOMER NO.

WE CARE

FOR SERVICE CALL	TRANSPORTER	DOC. EXP.	SCHEDULED SERVICE WEEK	SCHEDULED TERRITORY	REFERENCE NUMBER
304 755 4210	PAUL REDDINGTON		06		P26283 M59572

CREDIT CODE	PREVIOUS BALANCE	BAL. OVER 60 DAYS

BUSINESS TYPE	CHAIN	OUTER COUNTY	SVC. P/C	PROD. P/C

LOCATION	TAX EXEMPTION NUMBER
40750	

4 - 095 - 72 -

W.V. Dept of Highways
218 Calk Ave
Charleston WV 25305

SERVICE DATE	SALES REP NO.	CUSTOMER P.O. NUMBER	CUSTOMER PHONE #	TAX CODE	HANDLING CODE		ASSOC. CODE	SERVICE TAX	C.O.M.S. TAX	PRODUCT TAX
6-25-98	4025	05333								

	DEPT	SERVICE/ PRODUCT		UNIT PRICE	QUANTITY	CHARGE	SALES TAX	TOTAL CHARGE	CHLORINE TEST RESULTS: HALOGEN TESTER PASS	HALOGEN TESTER FAIL	CHLOR-D-TECT RESULTS (PPM)	CHLOR-D-TECT TESTERS INITIALS	SK DOT NUMBER	CC	SERVICE TERM	CHANGE SERVICE TERM (MO. / ANNUAL)		CHANGE SCH. DATE	PROMO NO.	RELEASE NO.
1		Holding Water Disp		1.75	500	875.00		875.00	☐	☐										
2									☐	☐										
3									☐	☐										
4									☐	☐										
5									☐	☐										
6									☐	☐										
7									☐	☐										
8									☐	☐										
9									☐	☐										
		TOTAL-SERVICE/PRODUCTS				875.00		875.00	TANK CAPACITY											

GENERATOR STATUS: CHECK ONLY ONE BOX BELOW

GENERATOR: HAZARDOUS WASTE CLASSIFICATION *	VEHICLE FLUIDS ONLY	OTHER NON-VEHICLE FLUIDS
CESQG	☒ 1	☐ 3
SQG/LQG	☐ 2	☐ 4

1 NO PREQUAL REQUIRED, NO HALOGEN TEST
2 NO PREQUAL REQUIRED, HALOGEN TEST AT PICK-UP
3 PREQUAL REQUIRED, NO HALOGEN TEST
4 PREQUAL REQUIRED, HALOGEN TEST AT PICK-UP
* REFER TO REVERSE SIDE FOR DEFINITIONS

MANIFEST NO.
USEPA TRANSPORTER ID NO. ILD984908202
GENERATOR USEPA ID NO. Non Hazardous
GENERATOR STATE ID NO.

TRANSPORTER DATE 6/25/98
Jeff Gladwell — PRINT NAME
X — SIGNATURE

FACILITY DATE / /
PRINT NAME
X — SIGNATURE

PART NO. 1353 (7/97)

11. US DOT DESCRIPTION (INCLUDING PROPER SHIPPING NAME, HAZARD CLASS, AND ID.)	12. CONTAINERS NO.	TYPE	13. TOTAL QUANTITY	14. UNIT WT/VOL	SK DOT NUMBER
A. USED OIL AND WATER MIXTURE (NOT U.S DOT HAZARDOUS MATERIAL)	001	TT	500	G	927
B.					
C.					
D.					

WE CARE

INTERMEDIATE FACILITY NAME AND ADDRESS 105 Harris Dr SAFETY-KLEEN CORP. Paca Inc
USA EPA ID NO. WVD000820449
STATE ID NO.

OIL RECOVERY SERVICE/ SALES ACKNOWLEDGMENT

CASH ☐	TOTAL RECEIVED	APPLY PAYMENT TO:
CHECK NUMBER		☐ TODAY'S SERVICE/SALE ☐ PREVIOUS BALANCE AS FOLLOWS

INVOICE #	AMOUNT $	INVOICE #	AMOUNT $

PREVIOUS CREDIT CARD NO →

CREDIT CARD NO. AMEX VISA MC EXP. DATE

CUSTOMER REFERENCE

MANIFEST CODE	SEQ #
	1 D

IN THE EVENT OF AN EMERGENCY CALL

CHARGE MY ACCOUNT FOR THIS TRANSACTION UNLESS OTHERWISE INDICATED IN THE PAYMENT RECEIVED SECTION.
SEE ADDITIONAL TERMS AND CONDITIONS ON REVERSE SIDE AND MADE A PART HEREOF.

*This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

Print Name
X
GENERATOR/SHIPPER DESIGNATED REPRESENTATIVE SIGNATURE

TOTAL DUE 875.00

DO NOT WRITE IN THE AREA BELOW

M59572
P26283
4025

BILL OF LADING/MANIFEST

1. Shipper's US EPA ID No. (If Applicable): Non Hazardous | Document No.: 26283 | 2. Page 1 of 1 | **10528**

3. Shipper's Name and Mailing Address: W.V. Dept of Highways, 218 Cali Ave, Charleston WV 25305

4. Shipper's Phone (304)

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
SAFETY-KLEEN CORP.	ILD 984908202	304 755-4279
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone

9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
407502 SAFETY-KLEEN CORP. HARRIS DRIVE ROCK BRANCH IND PARK POCA WV 25159	WVR 000001446	304 755-4279

	11. Shipping Name and Description	HM	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a.	WASTE OIL AND WATER MIXTURE (NOT USDOT HAZARDOUS MATERIAL)		001	TT	500	G
b.						
c.						
d.						

15. Special Handling Instruction and Additional Information

MFST R/T# 00000000
EMERGENCY RESP 800-468-1760(24 HR). IF UNDELIVERABLE RETURN TO GENERATOR.

SKDOT# A: 1082 B: C: D:

16a. US DOT HAZARDOUS MATERIALS SHIPPER'S CERTIFICATION: *This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Printed/Typed Name | Signature required here if US DOT regulated | Month Day Year

16b. NON-REGULATED SHIPPER'S CERTIFICATION: I certify the materials described above on this form are not subject to federal regulations for Transportation or Disposal.

Printed/Typed Name: [illegible] | Sign here if material is not DOT regulated: X [signature] | Month Day Year: 06 25 98

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Tr H Gladwell | Signature: [signature] | Month Day Year: 06 25 98

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of materials covered by this form except as noted in Item 19.

Printed/Typed Name | Signature | Month Day Year

USE 16A OR 16B

IN EVENT OF EMERGENCY CALL 1-800-468-1760 (24 hours)

GENERATOR'S COPY

FORM NO. 90291 (11/96)

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-001

Respectfully Submitted:

CAL 1 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:15
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		85	2.0	mg/kg	SW8015	07/01/98 22:01 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		70	---	% REC	SW8015	07/01/98 22:01 RW

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-001

Respectfully Submitted:

Y. M. Wright

CAL 1 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:15
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 10:26 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		88	------	% REC	SW8015	06/30/98 10:26 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 10:26 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 10:26 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 10:26 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 10:26 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		100	------	% REC	SW8021	06/30/98 10:26 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-001

Respectfully Submitted:

Y. M. Wright

CAL 1 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:15
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-001

Respectfully Submitted:

CAL 1 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:15
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 14:38 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-001

Respectfully Submitted:

J. M. Wright

CAL 1 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:15
Date Received 06/26/98

Sampled by CLIENT

071098 0850

SPIKED SAMPLE ANALYSIS SUMMARY REPORT
FOR TCLP METALS

PARAMETER	CAS NO.	RESULT	SPIKE LEVEL	UNITS	PERCENT RECOVERY
QCSPIKE					
Lead [Pb]	7439-92-1	1.8	2.0	mg/L	90 %

All spike results are corrected for the sample background.

$$\text{Percent Recovery} = \frac{\text{BACKGROUND CORRECTED SPIKE RESULT}}{\text{SPIKE LEVEL}} \times 100$$

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
1258 Greenbrier Street, **Charleston, WV 25311-1002** – (304) 346-0725 Fax: (304) 346-0761
5712 Erdman Ave., **Baltimore, MD 21205-3598** – Tel: (410) 483-2200 Fax: (410) 483-2206
4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-002

Respectfully Submitted:

CAL 2 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:20
Date Received 06/26/98

Sampled by CLIENT

071098 0850

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		38	2.0	mg/kg	SW8015	07/02/98 00:17 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		67	----	% REC	SW8015	07/02/98 00:17 RW

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-002

Respectfully Submitted:

Y. M. Wright

071098 0850

CAL 2 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:20
Date Received 06/26/98

Sampled by CLIENT

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		ND	0.50	mg/kg	SW8015	06/30/98 10:49 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		91	------	% REC	SW8015	06/30/98 10:49 PAC
BTEX:						
Benzene	71-43-2	ND	0.025	mg/kg	SW8021	06/30/98 10:49 PAC
Toluene	108-88-3	ND	0.025	mg/kg	SW8021	06/30/98 10:49 PAC
Ethylbenzene	100-41-4	ND	0.025	mg/kg	SW8021	06/30/98 10:49 PAC
Total Xylenes	1330-20-7	ND	0.025	mg/kg	SW8021	06/30/98 10:49 PAC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		103	------	% REC	SW8021	06/30/98 10:49 PAC

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-002

Respectfully Submitted:

J. M. Wright

071098 0850

CAL 2 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:20
Date Received 06/26/98

Sampled by CLIENT

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK	DATE/TIME/ANALYST
Sample Phase		
Solid	YES	
Sludge		
Liquid		
Suspended Solids,%		
>0.5	YES	
<0.5		
Sample Treatment		
Extracted,Filtered, and Analyzed	YES	
Filtered, and Analyzed		
Analyzed		
Bottle Extraction Date & Analyst	---	SW1311 07/06/98 17:00 AW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT. OF HIGHWAYS

Laboratory Number 298-06-0924-002

Respectfully Submitted:

CAL 2 500 GAL USED OIL TANK COMPOSITE
UST CLOSURE CALIFORNIA AVE.

Date Sampled 06/25/98 13:20
Date Received 06/26/98

Sampled by CLIENT

071098 0850

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	07/08/98 14:47 MA

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

6-924-12

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: WEST VIRGINIA DIV. OF HIGHWAYS

CONTACT: CRAIG BLAKEMAN PHONE NO: (304) 558-3035

PROJECT: UST CLOSURE SITE: CALIFORNIA AVE

REPORTS TO: WJ DOAN
1334 SMITH ST.
CHAS, WV, 25301 FAX NO: ( )

INVOICE TO:
SAME.

P.O. NUMBER:

CT&E Reference:

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C=COMP G=GRAB	Preservatives Used	Analysis Required (3) TPH(GRO-DRO)	BTEX	TCLP LEAD	REMARKS
CAL 1	500gal Used Oil Tank	6/25	1:15		1	C		✓	✓	✓	
CAL 2	500gal Used Oil Tank	6/25	1:20		1	C		✓	✓	✓	
	CAL 1 = USEW WALL										
	CAL 2 = BOTTOM EK.										

(5)

Collected / Relinquished By: (1)	Date	Time	Received By:
Craig Blakeman	6/26 98	4:35	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/26	Time 4:30	Received For Laboratory By:

(4)

Shipping Carrier:	Samples Received Cold? (Circle) YES NO
Shipping Ticket No:	Temperature °C: 13
Data Deliverables Required Level I Level II Level III	Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:	

1258 Greenbrier Street **Charleston, WV 25311** Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

6-924-1/2

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: WEST VIRGINIA DIV. OF HIGHWAYS

CONTACT: CRAIG BLAKEMAN PHONE NO: (304) 558-3050

PROJECT: UST CLOSURE SITE: CALIFORNIA AVE

REPORTS TO: WV DOH
1334 SMITH ST.
CHAS. WV. 25301 FAX NO: ( )

INVOICE TO:
SAME.

P.O. NUMBER:

CT&E Reference:

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C= COMP G= GRAB	Preservatives Used	Analysis Required (3) TPH(GAS-DRO)	BTEX	TCLP LEAD	REMARKS
CAL 1	500GA / Used Oil Tank	6/25	1:15		1	C		✓	✓	✓	
CAL 2	500GA / Used Oil Tank	6/25	1:20		1	C		✓	✓	✓	
	CAL 1 = USEW WALL										
	CAL 2 = BOTTOM EX.										

(5)

Collected / Relinquished By: (1)	Date	Time	Received By:
[signature]	6/26 GB	4:35	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/26	Time 4:30	Received For Laboratory By: [signature]

(4)

Shipping Carrier:

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: 13

Data Deliverables Required

Level I Level II Level III

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

1258 Greenbrier Street **Charleston, WV 25311** Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

safety-kleen

One Brinckman Way
Elgin, Illinois 60123-7857
CUSTOMER NO.

WE CARE

DUNS NO. 05106-0408 FED. ID NO. 39-6090019 CUSTOMER

FOR SERVICE CALL	TRANSPORTER	DOC. EXP.	SCHEDULED SERVICE WEEK	SCHEDULED TERRITORY	REFERENCE NUMBER
304 755 4279	PAUL REDDINGTON		98		P26283 MS9572

CREDIT CODE	PREVIOUS BALANCE	BAL. OVER 60 DAYS

BUSINESS TYPE	CHAIN	OUTER COUNTY	SVC. P/C	PROD. P/C

LOCATION	TAX EXEMPTION NUMBER
	407502

CUSTOMER GENERATOR

4 - 095 - 72 -

W.V. Dept of Highways
218 Calif. Ave
Charleston WV 25305

BILL TO

SERVICE DATE	SALES REP NO.	CUSTOMER P.O. NUMBER	CUSTOMER PHONE #	TAX CODE	HANDLING CODE		ASSOC. CODE	SERVICE TAX	C.O.M.S. TAX	PRODUCT TAX
6-25-98	4025	05555								

	DEPT	SERVICE/ PRODUCT		UNIT PRICE	QUANTITY	CHARGE	SALES TAX	TOTAL CHARGE	CHLORINE TEST RESULTS: HALOGEN TESTER PASS	FAIL	CHLOR-D-TECT RESULTS (PPM)	CHLOR-D-TECT TESTERS INITIALS	SK DOT NUMBER	CC	SERVICE TERM	CHANGE SERVICE TERM (WEEKS)	(INITIAL)	CHANGE SCH DATE (YY WW)	PROMO NO.	RELEASE NO.
1		1661.62	Water D.O	1.75	500	875.00		875.00	☐	☐										
2									☐	☐										
3									☐	☐										
4									☐	☐										
5									☐	☐										
6									☐	☐										
7									☐	☐										
8									☐	☐										
9									☐	☐										

TOTAL-SERVICE/PRODUCTS		875.00		875.00	TANK CAPACITY

TRANSPORTER DATE 6/25/98
Jeff Gladwell (PRINT NAME) X (SIGNATURE)

FACILITY DATE / /
(PRINT NAME) X (SIGNATURE)

GENERATOR STATUS: CHECK ONLY ONE BOX BELOW

GENERATOR: HAZARDOUS WASTE CLASSIFICATION *	VEHICLE FLUIDS ONLY	OTHER NON-VEHICLE FLUIDS
CESQG	☒ 1	☐ 3
SQG/LQG	☐ 2	☐ 4

1 NO PREQUAL REQUIRED, NO HALOGEN TEST
2 NO PREQUAL REQUIRED, HALOGEN TEST AT PICK-UP
3 PREQUAL REQUIRED, NO HALOGEN TEST
4 PREQUAL REQUIRED, HALOGEN TEST AT PICK-UP
* REFER TO REVERSE SIDE FOR DEFINITIONS

MANIFEST NO.
USEPA TRANSPORTER ID NO. ILD984908202
GENERATOR USEPA ID NO. Non Hazardous
GENERATOR STATE ID NO.

	11. US DOT DESCRIPTION (INCLUDING PROPER SHIPPING NAME, HAZARD CLASS, AND ID.)	12. CONTAINERS NO.	TYPE	13. TOTAL QUANTITY	14. UNIT WT/VOL	SK DOT NUMBER
A.	USED OIL AND WATER MIXTURE (NOT USDOT HAZARDOUS MATERIAL)	00	TT	500	G	927
B.						
C.						
D.						

INTERMEDIATE FACILITY NAME AND ADDRESS 105 Harris Dr. SAFETY-KLEEN CORP. Poca WV
USA EPA ID NO. WVD000001446
STATE ID NO.

WE CARE

OIL RECOVERY SERVICE/ SALES ACKNOWLEDGMENT

PART NO. 1353 (7/97)

PAYMENT RECEIVED SECTION

CASH ☐	TOTAL RECEIVED	APPLY PAYMENT TO:
CHECK NUMBER		☐ TODAY'S SERVICE/SALE ☐ PREVIOUS BALANCE AS FOLLOWS

INVOICE #	AMOUNT $	INVOICE #	AMOUNT $
PREVIOUS CREDIT CARD NO →			

CREDIT CARD NO. AMEX VISA MC EXP. DATE

CUSTOMER REFERENCE INFORMATION

MANIFEST CODE	SEQ #
	1 D

IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

CHARGE MY ACCOUNT FOR THIS TRANSACTION UNLESS OTHERWISE INDICATED IN THE PAYMENT RECEIVED SECTION.
SEE ADDITIONAL TERMS AND CONDITIONS ON REVERSE SIDE AND MADE A PART HEREOF.

"This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation"

Print Name CHRIS BERGEMAN
X (GENERATOR/SHIPPER DESIGNATED REPRESENTATIVE SIGNATURE)

TOTAL DUE 875.00

DO NOT WRITE IN THE AREA BELOW

M59572
P26283
4025

SEE REVERSE SIDE FOR IMPORTANT INFORMATION

Additional Terms and Conditions

Definition of Terms
When used in this document, the following terms shall have the meanings given below:

Used Oil means any oil that has been refined from crude oil or any synthetic oil, that has been used and as a result of such use is contaminated by physical or chemical impurities. As used herein, Used Oil includes oil generated by individuals through the maintenance of their personal vehicles (hereinafter do-it-yourselfer used oil). Petroleum hydrocarbons used as solvents are specifically excluded from the definition of Used Oil.

Nonhazardous Wastes include spent materials that are not listed in 40 CFR Part 261 Subpart D and do not exhibit any of the characteristics included in 40 CFR Part 261 Subpart C.

Vehicle Fluids are limited to Used Oils, nonhazardous antifreeze, and oily waters originating from the maintenance of vehicles, and household do-it-yourselfer used oil. The term vehicle as used herein includes, but is not limited to automobiles, buses, trucks, tractors, aircraft and similar type vehicles utilizing internal combustion engines.

Non-Vehicle Fluids include all Used Oils and Nonhazardous Wastes that are not classified as Vehicle Fluids. Non-Vehicle Fluids include, but are not limited to cutting oils, hydraulic fluids, compressor oils, metal working oils and other nonhazardous aqueous waste streams. Mixtures of Non-Vehicle Fluids with Vehicle Fluids are classified as Non-Vehicle Fluids.

Nonconforming Wastes include: 1) materials provided to Safety-Kleen which have been mixed, combined or otherwise blended with materials containing regulated levels of polychlorinated biphenyls (PCBs); 2) materials provided to Safety-Kleen which have been mixed, combined, or otherwise blended with materials regulated as hazardous wastes under applicable laws, including but not limited to 40 CFR Part 261; and 3) materials provided to Safety-Kleen that exhibit chemical or physical characteristics which deviate from the analytical results obtained from analysis of Customer's prequalification sample previously provided to Safety-Kleen.

CESQG, conditionally exempt small quantity generator. Customer is a CESQG if he generates no more than 100 kilograms of hazardous wastes in a given calendar month. In the event that Customer is located in a state that has adopted a more stringent definition, then the state definition shall apply.

SQG, small quantity generator. Customer is a SQG if he generates more than 100 kilograms but less than 1000 kilograms of hazardous wastes in a given calendar month. In the event that Customer is located in a state that has adopted a more stringent definition, then the state definition shall apply.

LQG, large quantity generator. Customer is a LQG if he generates more than 1000 kilograms of hazardous wastes in a given calendar month. In the event that Customer is located in a state that has adopted a more stringent definition, then the state definition shall apply.

I. Safety-Kleen's Oil Service

Safety-Kleen's oil service includes the collection, transportation, and recycling or treatment of Used Oils and Nonhazardous Wastes in accordance with the requirements of 40 CFR Part 279 and applicable solid waste regulations. Customer is responsible for properly classifying his waste streams in accordance with the provisions of 40 CFR 262.11. Safety-Kleen will collect and transport the materials, based on Customer's representation of the materials, in accordance with all applicable local, state, and federal regulations, and may use third party transporters or rail companies to transport said materials to its final destination. Safety-Kleen has the capacity and is permitted to accept, store and reclaim or process the materials described on the reverse side of this document.

Based on representations made by Customer regarding the type of oil generated and the hazardous waste generation rate, Safety-Kleen may screen the materials for the presence of regulated hazardous wastes. In addition, at the time of collection Safety-Kleen may take and retain a sample of the material collected. Upon request at time of service, Safety-Kleen will provide Customer with a retain sample of the material collected.

II. Warranties and Indemnification

Customer warrants and represents that the materials provided hereunder are limited to Used Oils, Nonhazardous Wastes, and/or CESQG wastes as defined above. Customer further warrants and represents that no Nonconforming Wastes, as defined above, have been provided to Safety-Kleen. Safety-Kleen relies on Customer's representations and Customer is responsible for informing Safety-Kleen of any process changes that may alter the characteristics of the materials provided to Safety-Kleen.

In the event that materials provided hereunder are found by Safety-Kleen not to conform, or are suspected of not conforming, with the representations provided herein, Customer agrees to provide Safety-Kleen or its representatives access to the tanks/containers which had stored the materials for the purpose of taking a sample of any remaining residuals.

In the event that any materials provided hereunder are found not to conform with representations provided herein, Safety-Kleen may, at its option and if allowed by law, return the materials, and all waste streams subsequently contaminated thereby, to Customer, or Safety-Kleen may cause such materials to be properly disposed of. Customer shall be responsible for all expenses incurred in the proper disposal of Nonconforming Wastes, and the disposal of materials subsequently contaminated thereby. Customer agrees to indemnify and hold harmless Safety-Kleen, its officers, directors, employees and agents from and against any and all losses, expenses, damages, demands, claims, or judgments arising out of or relating to Customer's breach of these terms and conditions.

INVOICES REFLECTING CHARGES TO CUSTOMER ARE SUBJECT TO AN INTEREST RATE OF THE LESSER OF 1.5% PER MONTH (18% PER ANNUM) OR THE MAXIMUM RATE ALLOWED BY LAW ON ANY INVOICES THAT ARE NOT PAID WITHIN 30 DAYS. IN THE EVENT OF DEFAULT, SAFETY KLEEN SHALL BE ENTITLED TO RECOVER COSTS OF COLLECTION, INCLUDING REASONABLE ATTORNEY'S FEES.
IN THE EVENT THE CREDIT CARD ISSUER REFUSES TO ACCEPT THE CREDIT CARD CHARGE FOR THIS TRANSACTION, YOU ARE AUTHORIZED TO CHARGE THE AMOUNT OF THIS TRANSACTION TO MY SAFETY-KLEEN ACCOUNT.

SAFETY-KLEEN RELIES ON THESE WARRANTIES OF THE CUSTOMER IN ENTERING INTO THIS AGREEMENT TO TRANSPORT THE USED FLUIDS IN ACCORDANCE WITH ALL APPLICABLE STATE AND FEDERAL REGULATIONS. CUSTOMER AGREES TO INDEMNIFY, DEFEND, AND HOLD SAFETY-KLEEN HARMLESS FOR ANY AND ALL DAMAGES SUFFERED BY SAFETY-KLEEN ARISING OUT OF OR RELATING IN ANYWAY TO ITS BREACH OF THE AGREEMENT OR ITS POSSESSION AND/OR USE OF THE ABOVE REFERENCED CONTAINER(S).

IN ADDITION TO AN IN ACCORDANCE WITH THE TERMS AND CONDITIONS ON THE REVERSE SIDE OF THIS DOCUMENT, CUSTOMER EXPRESSLY WARRANTS AND REPRESENTS TO SAFETY-KLEEN CORP. THAT:

1. THE MATERIALS PROVIDED HEREUNDER HAVE NOT BEEN MIXED, COMBINED OR OTHERWISE BLENDED IN ANY QUANTITY WITH MATERIALS CONTAINING POLYCHLORINATED BIPHENYLS (PCBs) OR ANY OTHER MATERIAL REGULATED AS A HAZARDOUS WASTE UNDER APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO 40 CFR PART 261, AND

2. THE BOX CHECKED IN THE GENERATOR STATUS SECTION ABOVE ACCURATELY REFLECTS CUSTOMER'S HAZARDOUS WASTE STATUS AND THE TYPE OF FLUIDS GENERATED, AS DEFINED ON THE BACK OF THIS DOCUMENT.

CUSTOMER AGREES TO INDEMNIFY AND HOLD SAFETY-KLEEN CORP. HARMLESS FOR ANY DAMAGES, COSTS, ATTORNEY'S FEES, ETC. ARISING OUT OF OR IN ANYWAY RELATED TO A BREACH BY CUSTOMER OF THE ABOVE WARRANTY OR THE ADDITIONAL TERMS AND CONDITIONS.

STATE OF NEW HAMPSHIRE CERTIFICATION (N.H. CUSTOMERS ONLY)

This used oil is destined to be recycled and is subject to regulation by the New Hampshire Department of Environmental services under Part ENV-WM 807. I certify that this used oil is not hazardous waste fuel as defined in ENV-WM 807.04 and that I have not mixed this used oil with any other hazardous wastes identified in Chapter ENV-WM 400 or any used oil classified as a hazardous waste fuel under 807.04. Customer signature is required on front.



BILL OF LADING/MANIFEST

1. Shipper's US EPA ID No. (If Applicable): Non Hazardous | Document No.: 26283 | 2. Page 1 of 1 | **10528**

3. Shipper's Name and Mailing Address: W.V. Dept of Highways, 216 Capitol Ave, Charleston WV 25305

4. Shipper's Phone (204)

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
SAFETY-KLEEN CORP.	ILD 984908202	304 755-4279
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone

9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
407502 SAFETY-KLEEN CORP. HARRIS DRIVE ROCK BRANCH IND PARK POCA WV 25159	WVR 000001446	304 755-4279

	11. Shipping Name and Description	HM	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a.	WASTE OIL AND WATER MIXTURE (NOT USDOT HAZARDOUS MATERIAL)		001	TT	500	G
b.						
c.						
d.						

15. Special Handling Instruction and Additional Information

MFST R/T# 00000000
EMERGENCY RESP 800-468-1760(24 HR). IF UNDELIVERABLE RETURN TO GENERATOR.

SKDOT# A: 1082 B: C: D:

SHIPPER

USE 16A OR 16B

16a. US DOT HAZARDOUS MATERIALS SHIPPER'S CERTIFICATION: *This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Printed/Typed Name | Signature required here if US DOT regulated | Month Day Year

16b. NON-REGULATED SHIPPER'S CERTIFICATION: I certify the materials described above on this form are not subject to federal regulations for Transportation or Disposal.

Printed/Typed Name | Sign here if material is not DOT regulated | Month Day Year 06 25 98

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Jim A Gladwell | Signature | Month Day Year 06 25 98

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of materials covered by this form except as noted in Item 19.

Printed/Typed Name | Signature | Month Day Year

IN EVENT OF EMERGENCY CALL 1-800-468-1760 (24 hours)

GENERATOR'S COPY

FORM NO. 90291 (11/96)

CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: WV. DIVISION OF HIGHWAYS

CONTACT: CRAIG BLANKENSHIP PHONE NO: (304) 558-3050

PROJECT: UST CLOSURE SITE: CALIFORNIA AVE

REPORTS TO: WV DOH 1334 SMITH STREET CHARLESTON, WV. 25301 FAX NO: (304) 558-6391

INVOICE TO: SAME P.O. NUMBER:

CT&E Reference:

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C = COMP G = GRAB	Preservatives Used	Analysis Required (3) TPH(GRO DRO)	BTEX	TCLP LEAD	REMARKS
CAL 1	PUMP ISLAND	11/13/98			4oz	C		✓	✓	✓	

(5)

Collected/Relinquished By: (1)	Date	Time	Received By:
Craig Blankenship	11/18/98	09:05	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 11-18-98	Time 09:05	Received For Laboratory By: GRhodes

(4)

Shipping Carrier: Client

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: 3

Data Deliverables Required

Level I Level II Level III

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

1258 Greenbrier Street **Charleston, WV 25311** Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT OF HIGHWAYS

Laboratory Number 298-11-0487-001

Respectfully Submitted:

J. M. Wright

PUMP ISLAND COMPOSITE
UST CLOSURE

Date Sampled 11/18/98
Date Received 11/18/98

Sampled by CLIENT

113098 1423

ANALYSIS FOR REQUESTED PARAMETERS
ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Gasoline Range Organics (GRO)		7.5	0.50	mg/kg	SW8015	11/19/98 19:43 JC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		98	------	% REC	SW8015	11/19/98 19:43 JC
BTEX:						
Benzene	71-43-2	0.34	0.025	mg/kg	SW8021	11/19/98 19:43 JC
Toluene	108-88-3	0.64	0.025	mg/kg	SW8021	11/19/98 19:43 JC
Ethylbenzene	100-41-4	0.23	0.025	mg/kg	SW8021	11/19/98 19:43 JC
Total Xylenes	1330-20-7	1.7	0.025	mg/kg	SW8021	11/19/98 19:43 JC
SURROGATE RECOVERY						
a,a,a-Trifluorotoluene<SURROGATE>		100	------	% REC	SW8021	11/19/98 19:43 JC

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
1258 Greenbrier Street, **Charleston, WV 25311-1002** – (304) 346-0725 Fax: (304) 346-0761
5712 Erdman Ave., **Baltimore, MD 21205-3598** – Tel: (410) 483-2200 Fax: (410) 483-2206
4440 Glen Este-Withamsville Road, Suite 900, **Cincinnati, OH 45245-1331** – Tel: (513) 752-9696 Fax: (513) 752-2614

CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

Locations Nationwide
- Alaska
- California
- Florida
- Illinois
- Maryland
- Michigan
- Missouri
- New Jersey
- Ohio
- Pennsylvania
- West Virginia

(1)

CLIENT: WV. DIVISION OF HIGHWAYS

CONTACT: CRAIG BLAKEMAN PHONE NO: (304) 558-3050

PROJECT: UST CLOSURE SITE: CALIFORNIA AVE

REPORTS TO: WV DOH 1334 SMITH STREET CHARLESTON, WV. 25301 FAX NO: (304) 558-6391

INVOICE TO: SAME P.O. NUMBER:

CT&E Reference: 11-487-001

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C = COMP G = GRAB	Preservatives Used	Analysis Required (3) TPH(GRO DRO)	BTEX	TCLP LEAD	REMARKS
CAL 1	PUMP ISLAND	11/18/98			4oz	C		✓	✓	✓	

(5)

Collected/Relinquished By: (1)	Date	Time	Received By:
Craig L Blakeman	11/18/98	09:05	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 11-18-98	Time 09:05	Received For Laboratory By: C.R. Rhodes

(4)

Shipping Carrier: Client

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: 8

Data Deliverables Required

Level I Level II Level III

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

CT&E Environmental Services Inc.

Laboratory Division

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ALL RESULTS ARE ON AN AS RECEIVED BASIS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ	UNITS	METHOD	DATE/TIME/ANALYST
Diesel Range Organics (DRO)		5.0	2.0	mg/kg	SW8015	11/24/98 16:42 RW
SURROGATE RECOVERY						
o-Terphenyl<SURROGATE>		99	------	% REC	SW8015	11/24/98 16:42 RW

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

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CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

Craig Blakeman
WEST VIRGINIA DEPT OF HIGHWAYS

Laboratory Number 298-11-0487-001

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UST CLOSURE

Date Sampled 11/18/98
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Sampled by CLIENT

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SPIKED SAMPLE ANALYSIS SUMMARY REPORT
FOR TCLP METALS

PARAMETER	CAS NO.	RESULT	SPIKE LEVEL	UNITS	PERCENT RECOVERY
QCSPIKE					
Lead [Pb]	7439-92-1	1.9	2.0	mg/L	95 %

All spike results are corrected for the sample background.

$$\text{Percent Recovery} = \frac{\text{BACKGROUND CORRECTED SPIKE RESULT}}{\text{SPIKE LEVEL}} \times 100$$

4665 Paris Street, Suite 200-B, **Denver, CO 80239** – Tel: (303) 373-4847 Fax: (303) 373-4884
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113098 1423

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE:METALS

ANALYZED PARAMETER	CAS NO.	RESULT	LOQ (MG/L)	METHOD	REGULATORY LEVEL	DATE/TIME/ANALYST
Metals - TCLP Basis						
Lead [Pb]	7439-92-1	ND	0.10	SW6010	5.0	11/23/98 16:26 JJ

ND: Not detected at a concentration greater than the LOQ - Limit of Quantitation.

Method Reference: USEPA: Test Methods For Evaluating Solid Waste; SW-846, 3rd Edition; Nov 1986.

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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1258 Greenbrier Street, **Charleston, WV 25311-1002** – (304) 346-0725 Fax: (304) 346-0761
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Laboratory Number 298-11-0487-001

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Sampled by CLIENT

113098 1423

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

SAMPLE EVALUATION AND TREATMENT	CHECK		DATE/TIME/ANALYST
Sample Phase			
Solid	YES		
Sludge			
Liquid			
Suspended Solids,%			
>0.5	YES		
<0.5			
Sample Treatment			
Extracted,Filtered, and Analyzed	YES		
Filtered, and Analyzed			
Analyzed			
Bottle Extraction Date & Analyst	---	SW1311	11/19/98 15:45 TAW

TCLP Extraction Procedure and Regulatory Levels: 40 CFR Part 261.24 and Appendix II.

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Laboratory Division

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(1)

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CONTACT: CRAIG BLAKEMAN PHONE NO: (304) 558-3050

PROJECT: UST CLOSURE SITE: CALIFORNIA AVE

REPORTS TO: WVDOH 1334 SMITH STREET CHARLESTON, WV. 25301 FAX NO: 304 558-6391

INVOICE TO: SAME P.O. NUMBER:

CT&E Reference: 11-487-001 PAGE ____ OF ____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C = COMP G = GRAB	Preservatives Used	Analysis Required (3) TPH(GRO DRO)	BTEX	TCLP LEAD	REMARKS
CAL 1	PUMP ISLAND	11/18/98			4oz	C		✓	✓	✓	

(5)

	Date	Time	
Collected/Relinquished By: (1) Craig L Blakeman	11/18/98	09:05	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 11-18-98	Time 09:05	Received For Laboratory By: C Rhodes

(4)

Shipping Carrier: Client

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: 8

Data Deliverables Required

Level I Level II Level III

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

1258 Greenbrier Street **Charleston, WV 25311** Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

RECEIVED
JUL 26 1995
OFFICE OF WASTE MANAGEMENT
UST SECTION
CHARLESTON, WV 25301-1401

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
Office of the District Engineer

Gaston Caperton
Governor

District One
1334 Smith Street • Charleston, West Virginia 25301 • 304/558-3001

Charles L. Miller, P.E.
Secretary

Fred VanKirk, P.E.
Commissioner

July 19, 1995

Ms. Paula Duncan, Technical Assistant
W.V. Division of Environmental Protection
Office of Waste Management, U.S.T Section
1356 Hansford Street
Charleston, WV 25301

Dear Ms. Duncan,

As per direction of memo dated May 15, 1995, this office forwards the enclosed amended U.S.T. forms for the reconciliation of the records of District One, between our agencies.

Should you have any questions or need further information please contact this office at the above letterhead address.

Very truly yours,

Carl O. Thompson

Carl O. Thompson
District Engineer

OK

OMB NO. 2050-0068, Approval Expires 1/31/95

Notification for Underground Storage Tanks

State Agency Name and Address: WV Div. of Environmental Protection, Office of Waste Mgmt., UST Section
1356 Hanford Street, Charleston, WV 25301

STATE USE ONLY

ID NUMBER 2002051

F.E.I.N.: No.

A. Date Entered Into Computer _____
B. Data Entry Clerk Initials _____
C. Owner Was Contacted to Clarify Responses. Comments

TYPE OF NOTIFICATION

☐ A. NEW FACILITY ☑ B. AMENDED ☐ C. CLOSURE

1 No. of tanks at facility ____ No. of continuation sheets attached

INSTRUCTIONS

Please type or print in ink all items except "signature" in section VIII. This form must be completed for each location containing underground storage tanks. If more than five (5) tanks are owned at this location, photocopy the following sheets, and staple continuation sheets to the form.

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances , that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances; and

b) in the case of any underground storage tank in use before November 8, 1984, but no longer is use on that date, any person who owned such tank immediately before the discontinuation of its use.

c) if the State agency so requires, any facility that has undergone any changes to facility information or tank system status (only amended tank information needs to be included).

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. Gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situate upon or above the surface of the floor.

What Subetances Are Covered? The notification requirements apply to under ground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Send completed forms to:

WV Division of Environmental Protection
Office of Waste Management
UST Section
1356 Hanford Street
Charleston, WV 25301

RECEIVED
JUL 26 1995
OFFICE OF WASTE MANAGEMENT
UST SECTION

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation , but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use. 3. If the State requires notification of any amendments to facility send information to State agency immediately.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)

Street Address: WEST VIRGINIA DIVISION OF HIGHWAYS

City: EQUIPMENT DIVISION State: ZIP Code:

County: BUCKHANNON WV. 26201

Phone Number (Include Area Code): (304) (472-1750)

II. LOCATION OF TANK(S)

If required by State, give the geographic location of tanks by degrees, minutes, and seconds. Examples Lat. 42, 36, 12 N Long. 85, 24, 17W

Latitude 38° 36' 06" Longitude 81° 36' 33"

(if same as Section I, mark box here ☐)

Facility Name or Company Site Identifier, as applicable: WV. DOH CENTRAL MOTOR POOL

Street Address (P.O. Box not acceptable): CALIFORNIA AVE.

City: CHARLESTON State: WV Zip code: 25305

County: KANAWHA Municipality:

EPA form 7530-1 (Revised 2-92)

III. TYPE OF OWNER

- ☐ Federal Government
- ☑ State Government
- ☐ Local Government
- ☐ Commercial
- ☐ Private

IV. INDIAN LANDS

Tanks are located on land within an Indian Reservation or on other trust lands. ☐

Tanks are owned by native American nation, tribe, or individual. ☐

Tribe or Nation: _____

V. TYPE OF FACILITY

Select the Appropriate Facility Description

- ____ Gas Station
- ____ Petroleum Distributor
- ____ Air Taxi (Airline)
- ____ Aircraft Owner
- ____ Auto Dealership
- ____ Railroad
- ____ Federal - Non-Military
- ____ Federal - Military
- ____ Industrial
- ____ Contractor
- ____ Trucking/Transport
- ____ Utilities
- ____ Residential
- ____ Farm
- ✓ Other (Explain) WV. DOH CENTRAL MOTOR POOL

VI. CONTACT PERSON IN CHARGE OF TANKS

Name	Job Title	Address	Phone Number (Include Area Code)
CRAIG L. BLAKEMAN	UST. COORDINATOR	1334 SMITH ST. CHARLESTON WV, 25301	(304) (558-3050)

VII. FINANCIAL RESPONSIBILITY

I have met the financial responsibility requirements in accordance with 40 CFR Subpart H ☐

Check All that Apply

- ☑ Self Insurance
- ☐ Commercial Insurance
- ☐ Risk Retention Group
- ☐ Guarantee
- ☐ Surety Bond
- ☐ Letter of Credit
- ☑ State Funds
- ☐ Trust Fund
- ☐ Other Method Allowed Specify

_____

VIII. CERTIFICATION (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative (Print)	Signature	Date Signed
Craig L. Blakeman UST. Coordinator Dist 1	Craig L. Blakeman	7/25/95

EPA estimates public reporting burden for this form to average 30 minutes per response including time for reviewing instructions, gathering and maintaining the data needed and completing and reviewing the form. Send comments regarding this burden estimate to Chief, Information Policy Branch PM-223, U.S. Environmental Protection Agency, 401 M Street, Washington D.C. 20460, marked "Attention Desk Officer for EPA." This form amends the previous notification form as printed in 40 CFR Part 280, Appendix I. Previous editions of this notification form may be used while supplies last.

IX. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification Number	Tank No. 1	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____
1. Status of Tank (mark only one) — Currently in Use					
Temporarily Out of Use (Remember to fill out section X.)					
Permanently Out of Use (Remember to fill out section X.)	✓				
Amendment of Information					
2. Date of Installation (mo./year)					
3. Estimated Total Capacity (gallons)					
4. Material of Construction (Mark all that apply)					
Asphalt Coated or Bare Steel	✓				
Cathodically Protected Steel					
Epoxy Coated Steel					
Composite (Steel with Fiberglass)					
Fiberglass Reinforced Plastic					
Lined Interior					
Double Walled					
Polyethylene Tank Jacket					
Concrete					
Excavation Liner					
Unknown					
Other, Please specify					
Has tank been repaired?					
5. Piping (Material) (Mark all that apply) — Bare Steel	✓				
Galvanized Steel					
Fiberglass Reinforced Plastic					
Copper					
Cathodically Protected					
Double Walled					
Secondary Containment					
Unknown					
Other, Please specify					
6. Piping (Type) (Mark all that apply)					
Suction: no valve at tank					
Suction: valve at tank	✓				
Pressure					
Gravity Feed					
Has piping been repaired?					

Tank Identification Number	Tank No. 1	Tank No.	Tank No.	Tank No.	Tank No.
7. Substance Currently or Last Stored In Greatest Quantity by Volume					
Gasoline	6000 gallon				
Diesel					
Gasohol					
Kerosene					
Heating Oil					
Used Oil					
Other, Please specify					
Hazardous Substance CERCLA name and/or, CAS number					
Mixture of Substances Please specify					

X. TANKS OUT OF USE, OR CHANGE IN SERVICE

1. Closing of Tank					
A. Estimated date last used (mo./day/year)	01-92				
B. Estimate date tank closed (mo./day/year)	01-92				
C. Tank was removed from ground	✓				
D. Tank was closed in ground					
E. Tank filled with inert material					
Describe					
F. Change in service					
2. Site Assessment Completed					
Evidence of a leak detected					

XI. CERTIFICATION OF COMPLIANCE (COMPLETE FOR ALL NEW AND UPGRADED TANKS AT THIS LOCATION)

Tank Identification Number	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____
1. Installation					
A. Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
B. Installer certified or licensed by the implementing agency	☐	☐	☐	☐	☐
C. Installation inspected by a registered engineer	☐	☐	☐	☐	☐
D. Installation inspected and approved by implementing agency	☐	☐	☐	☐	☐
E. Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
F. Another method allowed by State agency. Please specify.	☐	☐	☐	☐	☐

2. Release Detection (Mark all that apply)	TANK	PIPING	TANK	PIPING	TANK	PIPING	TANK	PIPING	TANK	PIPING
A. Manual tank gauging	☐		☐		☐		☐		☐	
B. Tank tightness testing	☐		☐		☐		☐		☐	
C. Inventory controls	☐		☐		☐		☐		☐	
D. Automatic tank gauging	☐		☐		☐		☐		☐	
E. Vapor monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
F. Groundwater monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
G. Interstitial monitoring double walled tank/piping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
H. Interstitial monitoring/secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I. Automatic line leak detectors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
J. Line tightness testing		☐		☐		☐		☐		☐
K. Other method allowed by Implementing Agency. Please specify.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	_____		_____		_____		_____		_____	

3. Spill and Overfill Protection					
A. Overfill device installed	☐	☐	☐	☐	☐
B. Spill device installed	☐	☐	☐	☐	☐

OATH: I certify the information concerning installation that is provided in section XI is true to the best of my belief and knowledge.

Installer: _____ (Name) _____ (Signature) _____ (Date)

_____ (Position) _____ (Company)

2002051 #4 4708

GASTON CAPERTON
Governor

WEST VIRGINIA
DEPARTMENT OF TRANSPORTATION
State Capitol Complex · Building Five · Charleston, West Virginia 25305 · 348-0444

Arthur L. Gleason, Jr.
Secretary

March 11, 1992

Mr. Gil W. Sattler
Department of Commerce, Labor &
Environmental Resources
Waste Management Section
1356 Hansford Street
Charleston, West Virginia 25301

Dear Mr. Sattler:

In accordance with our recent telephone conversation, please change the mailing address on Underground Storage Tank matters to;

West Virginia Division of Highways
Equipment Division
Post Office Box 610
Buckhannon, West Virginia 26201

Attention: Mr. Don E. Post
Fleet Planning Supervisor

Position responsibilities have changed since the Underground Storage Tank Program began. Tanks are now managed statewide by Mr. Post. Routing of pertinent correspondence to that office would be more efficient.

Thank you for your cooperation.

Sincerely,

Randall G. Biller
Executive Assistant

RGB:e

cc: HM, ME

C-2125-92

OMB NO. 2050-0068, Approval Expires 9/30/91
EPA form 7530-1 (Revised 9/89)

Notification for Underground Storage Tanks

STATE USE ONLY

State Agency Name and Address

ID NUMBER 39 020511

DATE RECEIVED

A. Date Entered Into Computer

B. Data Entry Clerk Initials

C. Owner Was Contacted to Clarify Responses. Comments

TYPE OF NOTIFICATION

☐ A. NEW FACILITY ☑ B. AMENDED ☐ C. CLOSURE

2 No. of tanks at facility ____ No. of continuation sheets attached

INSTRUCTIONS

Please type or print in ink all items except "signature" in section V. This form must be completed for each location containing underground storage tanks. If more than five (5) tanks are owned at this location, photocopy the following sheets, and staple continuation sheets to the form.

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1984, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and

b) in the case of any underground storage tank in use before November 8, 1984, but no longer is use on that date, any person who owned such tank immediately before the discontinuation of its use.

c) if the State agency so requires, any facility that has undergone any changes to facility information or tank system status (only amended tank information needs to be included).

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. Gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situate upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to under ground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g. crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Send completed forms to:

Waste Management Section
Division of Natural Resources
1356 Hansford Street
Charleston, WV 25301

RECEIVED MAR 4 1992 DIVISION OF NATURAL RESOURCES WASTE MANAGEMENT SECTION

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974 but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use. 3. If the State requires notification of any amendments to facility send information to State agency immediately.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
West Virginia Division of Highways

Street Address
Equipment Division

City Buckhannon State W.V. ZIP Code 26201

County Upshur

Phone Number (Include Area Code) (304) 472-1750

II. LOCATION OF TANK(S)

If required by State, give the geographic location of tanks by degrees, minutes, and seconds. Examples Lat. 42, 36, 12 N Long. 85, 24, 17W

Latitude 38°20'15" Longitude 81°36'30"

(if same as Section I, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
Division of Highways Refueling Station

Street Address (P.O. Box not acceptable)
California Avenue

City Charleston State W.V. Zip code 25305

County Kanawha Municipality

III. TYPE OF OWNER

- ☐ Federal Government
- ☑ State Government
- ☐ Local Government
- ☐ Commercial
- ☐ Private

IV. INDIAN LANDS

Tanks are located on land within an Indian Reservation or on other trust lands. ☐

Tanks are owned by native American nation, tribe, or individual. ☐

Tribe or Nation: _____

V. TYPE OF FACILITY

Select the Appropriate Facility Description

✓ Gas Station	____ Railroad	____ Trucking/Transport
____ Petroleum Distributor	____ Federal - Non-Military	____ Utilities
____ Air Taxi (Airline)	____ Federal - Military	____ Residential
____ Aircraft Owner	____ Industrial	____ Farm
____ Auto Dealership	____ Contractor	____ Other (Explain) _____

VI. CONTACT PERSON IN CHARGE OF TANKS

Name	Job Title	Address	Phone Number (Include Area Code)
C. Michael Jones	Dist. One Planning Eng.	1334 Smith St. Charleston W.V.	(304) 348-7836

VII. FINANCIAL RESPONSIBILITY

I have met the financial responsibility requirements in accordance with 40 CFR Subpart H ☐

Check All that Apply

☐ Self Insurance	☐ Guarantee	☑ State Funds
☐ Commercial Insurance	☐ Surety Bond	☐ Trust Fund
☐ Risk Retention Group	☐ Letter of Credit	☐ Other Method Allowed Specify

_____

VIII. CERTIFICATION (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true,accurate, and complete.

Name and official title of owner or owner's authorized representative (Print)	Signature	Date Signed
Joseph T. Deneault District Engineer	Joseph T. Deneault	2-26-92

EPA estimates public reporting burden for this form to average 30 minutes per response including time for reviewing instructions, gathering and maintaining the data needed and completing and reviewing the form. Send comments regarding this burden estimate to Chief, Information Policy Branch PM-223, U.S. Environmental Protection Agency, 401 M Street, Washington D.C. 20460, marked "Attention Desk Officer for EPA." This form amends the previous notification form as printed in 40 CFR Part 280, Appendix I. Previous editions of this notification form may be used while supplies last.

IX. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification Number	Tank No. 727-063	Tank No. No. Number A	Tank No. No. Number	Tank No. ____	Tank No. ____
1. Status of Tank (mark only one)					
Currently in Use	✓	✓			
Temporarily Out of Use (Remember to fill out section IX.)					
Permanently Out of Use (Remember to fill out section IX.)			✓		
Amendment of Information					
2. Date of Installation (mo./year)	2/8/92	1980	1980±		
3. Estimated Total Capacity (gallons)	4000	6000	6000		
4. Material of Construction (Mark all that apply)					
Asphalt Coated or Bare Steel		✓	✓		
Cathodically Protected Steel					
Epoxy Coated Steel					
Composite (Steel with Fiberglass)					
Fiberglass Reinforced Plastic	✓				
Lined Interior					
Double Walled					
Polyethylene Tank Jacket					
Concrete					
Excavation Liner					
Unknown					
Other, Please specify					
Has tank been repaired?					
5. Piping (Material) (Mark all that apply)					
Bare Steel					
Galvanized Steel		✓	✓		
Fiberglass Reinforced Plastic	✓				
Copper					
Cathodically Protected					
Double Walled					
Secondary Containment					
Unknown					
Other, Please specify					
6. Piping (Type) (Mark all that apply)					
Suction: no valve at tank	✓	✓			
Suction: valve at tank					
Pressure					
Gravity Feed					
Has piping been repaired?					

Tank Identification Number	Tank No.___	Tank No.___	Tank No. ___	Tank No. ___	Tank No. ___
7. Substance Currently or Last Stored In Greatest Quantity by Volume	727-063	No Number	No Number		
Gasoline	✓	✓	✓		
Diesel					
Gasohol					
Kerosene					
Heating Oil					
Used Oil					
Other, Please specify					
Hazardous Substance CERCLA name and/or, CAS number					
Mixture of Substances Please specify					
X. TANKS OUT OF USE, OR CHANGE IN SERVICE					
1. Closing of Tank			No. Number		
A. Estimated date last used (mo./day/year)			1/9/92		
B. Estimate date tank closed (mo./day/year)			2/1/92		
C. Tank was removed from ground			✓		
D. Tank was closed in ground					
E. Tank filled with inert material					
Describe					
F. Change in service					
2. Site Assessment Completed			2/1/92		
Evidence of a leak detected			NO		

XI. CERTIFICATION OF COMPLIANCE (COMPLETE FOR ALL NEW AND UPGRADED TANKS AT THIS LOCATION)

Tank Identification Number	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____
1. Installation					
A. Installer certified by tank and piping manufacturers					
B. Installer certified or licensed by the implementing agency					
C. Installation inspected by a registered engineer					
D. Installation inspected and approved by implementing agency					
E. Manufacturer's installation check-lists have been completed	✓				
F. Another method allowed by State agency. Please specify.					

2. Release Detection (Mark all that apply)	TANK	PIPING	TANK	PIPING	TANK	PIPING	TANK	PIPING	TANK	PIPING
A. Manual tank gauging	✓									
B. Tank tightness testing										
C. Inventory controls										
D. Automatic tank gauging										
E. Vapor monitoring	✓									
F. Groundwater monitoring										
G. Interstitial monitoring double walled tank/piping										
H. Interstitial monitoring/secondary containment										
I. Automatic line leak detectors										
J. Line tightness testing										
K. Other method allowed by Implementing Agency. Please specify.										

3. Spill and Overfill Protection					
A. Overfill device installed	Yes				
B. Spill device installed	Yes				

OATH: I certify the information concerning installation that is provided in section X is true to the best of my belief and knowledge.

Installer: Clifford M. Jones (Name) — [signature] (Signature) — 2/18/92 (Date)

Dist. Ops Planning (Position) — W.V. Division of Highways (Company)

TANK CLOSURE REPORT FOR:
(Complete One for Each Tank)
WV I.D. No. 03902051
Closure No. C-2125-92
Tank No. (from notification form) _____

Owner Name: W.V. Div. of Highways
Address: Equipment Division
Buckhannon W.V. 26201
Telephone(304) 472-1750
Contractor's Name: _____
Telephone(___) _____

I. Tank closure:

A. Liquid waste:
1) Type of liquid waste emptied from tank: Gas.
2) Amount of liquid waste emptied from tank: 40 ± gallon.
3) Disposal method of liquid waste Contained in Drum and location stored @ Nitro Storage Facility for Waste Courtesy.

B. Solid waste (sludges, scale, etc.):
1) Amount cleaned from tank: None.
2) Disposal method — and location _____.
3) Describe vapor purging methods: 100# Dry Ice
4) Describe tank cleaning methods: —

II. Tank abandonment only (Date _____**):**

A. Type of inert material used to fill tank: _____

III. Tank removal only (Date Feb. 1, 1992 **):**

A. Tank destination _____

B. Future use of tank: Junk.

IV. Piping closure (Date Feb. 1, 1992 **):**

A. Length of piping between tank and product dispenser: _____ feet.

B. Piping closure method: Removed From Ground & Junked

V. Site Assessment (Date Feb. 1, 1992 **):**

A. Free product present: Yes _____ No ✓.

B. Sampling:
1) Date of sampling: 2/1/92.
2) Type of sampling device: Soils Trowl
Water N/A.
3) Type of sample container: Soils 4 oz Gl. Jar.
Water N/A.
4) Composite samples: Yes ✓ No _____.

C. Analysis:
1) Lab name: Technical Testing Lab.
2) Date sample analyzed: 2/3/92-2/5/92 *Lab QA Plan should be available upon request.
3) A copy of original sample report as received from lab is requested in accordance with 280.34.

D. Provide a diagram of sample locations and depths.

Report completed by: C. L. Jones Date: 2/19/92

Rev. 1/92

Return this form to the Field Engineer at the DNR District Office for the county where the tanks are located.

GASTON CAPERTON
Governor

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
Equipment Division
Buckhannon, West Virginia 26201

Fred VanKirk
Commissioner -
State Highway Engineer

March 3, 1992

Mr. Ken Ellison
Division of Natural Resources
1356 Hansford Street
Charleston, WV 25301

Dear Mr. Ellison:

CLOSURE NUMBER C-2125-92-WV ID# 03902051
DISTRICT ONE SUB-STATION, CALIFORNIA AVENUE
CHARLESTON, WEST VIRGINIA

Attached is EPA Form 7530-1 and DNR Tank Closure Report for the removal of one (1) UST, ED NO. NOT KNOWN, and for the installation of one (1) UST, ED. NO. 727-0063, at the above location.

Test results of samples taken reveals that TPH, BTEX and LEAD are within acceptable limits, therefore no further activity is planned at this location.

If additional information is required, please contact Mike Jones at 348-7836, or Don Post at 557-4246 or 472-1750.

Very truly yours,

Robert L. Montgomery

Robert L. Montgomery
Director
Equipment Division

Attachments:

RLM/dp

cc: HM, ST, MH, District 1
District 1 Safety Inspector
ME Records Room, File

RECEIVED
MAR 4 1992
DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION

id # 03902051

STATE OF WEST VIRGINIA
DEPARTMENT OF COMMERCE, LABOR AND ENVIRONMENTAL RESOURCES
WASTE MANAGEMENT SECTION
1356 Hansford Street
Charleston, West Virginia 25301
Telephone (304) 348-6371

GASTON CAPERTON
Governor

J. EDWARD HAMRICK III
Director

ANN A. SPANER
Deputy Director

NOTICE OF CLOSURE

TO: Underground Storage Tank Owners and/or Operators

FROM: Underground Storage Tank Program
West Virginia Division of Natural Resources
Waste Management Section

DATE OF NOTICE: 1/9/92 EXPIRATION DATE: 3/9/92

This office has received your notice of tank removal and/or closure. Your site has been assigned closure number C-2125-92. Please refer to this number on any further correspondence concerning this closure. The tank closure is not to begin until 30 days after the date of notice. The site assessment may be performed during those 30 days.

If you should have any questions, please call Mark Foley at (304) 348-6371.

Owner/Operator Mailing Address:
WV Div of Highways
Equipment Division
Buckhannon WV 26201
Don Post

Location of tanks:
Dist. one Substation
212 California Ave
Charleston WV 25305

Date: 1/14/92
Signed: Jimmie A. Casto

Instructions:
1. Contact Mark Foley at least 5 days before beginning work.
2. If evidence of contamination if found, it must be reported to the WV DNR District office within 24 hours (See attached page).
3. Copies of site assessments indicating contamination are to be mailed to the appropriate WVDNR district offices. Notification forms are to be mailed to the Charleston office.

Comments: Remove 1 - 30 day waiver granted due to tank failing tightness test

Revised 1/92

03902051

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
Equipment Division
Buckhannon, West Virginia 26201

GASTON CAPERTON
Governor

Fred VanKirk
Commissioner -
State Highway Engineer

RECEIVED
JAN 13 1992

DIVISION OF NATURAL RESOURCES
WASTE MANAGEMENT SECTION

January 9, 1992

Mr. Ken Ellison
Division of Natural Resources
1356 Hansford Street
Charleston, WV 25301

Dear Mr. Ellison:

CLOSURE NUMBER REQUEST - WV ID UNKNOWN
DISTRICT ONE SUB-STATION, CALIFORNIA AVENUE
CHARLESTON, KANAWHA COUNTY, WEST VIRGINIA

The Division of Highways proposes to close one (1) UST, ED NO. UNKNOWN, at the above location. This tank is being closed due to having failed tank tightness testing. One new tank will be installed at this location. Closure number is requested. The Division of Highways requests waiver of the thirty (30) day notification period.

Very truly yours,

Donald E. Post for

Robert L. Montgomery
Director
Equipment Division

RLM/dp

cc: HM, ST, MH, District 1
District 1 Safety Inspector
File

STATE OF WEST VIRGINIA
DIVISION OF NATURAL RESOURCES
CHARLESTON 25305

GASTON CAPERTON
GOVERNOR

J. EDWARD HAMRICK III
DIRECTOR

ANN A. SPANER
DEPUTY DIRECTOR

Billed to Owner of Tanks
WV DEPT OF FINANCE & ADM.
212 CALIFORNIA AVE
CHARLESTON, WV 25305

WV ID No. 03902051
Invoice No. 901566
Billing Date July 15, 1990
Pay by August 31, 1990

Location of Tanks

DEP OF FIN & ADM TRANSPORTATION DIV
212 CALIFORNIA AVE
KANAWHA

No. of usable tanks in 1990 2

Description	Unit Price/Tank	No. Tanks	Total
Underground Storage Tank Administrative Fund	25.00	2	50
Leaking Underground Storage Tank Response Fund	20.00	2	40
	Invoice Total		90.00

Please make check payable to: West Virginia Division of Natural Resources and mail to:

West Virginia Division of Natural Resources
Waste Management Section - UST Fees
1356 Hansford Street
Charleston, West Virginia 25301

* Please write id number on check. *
WV ID No. 03902051

Amount Due in 1988	40.82	Amount Paid in 1988	40.82
Amount Due in 1989	62.00	Amount Paid in 1989	0.00
Amount Due in 1990	90.00	Amount Paid in 1990	

Total Payment Due 152.00

RECEIVED
91 JAN 14 PM 4:08
TRAVEL MANAGEMENT OFFICE

Loaded

Notification for Underground Storage Tanks

FORM APPROVED OMB NO. 2050-0068 APPROVAL EXPIRES: 3-31-88

FOR TANKS IN WV

RETURN COMPLETED FORM TO
UST Notification
Solid & Hazardous Waste/Ground Water Branch
West Virginia Dept. of Natural Resources
1201 Greenbriar Street
Charleston, WV 25311

STATE USE ONLY
I.D. Number
Date Received OCT 29 1986
GB
#03902051

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—
(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and
(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: **1.** gasoline, used oil, or diesel fuel, and **2.** industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:
1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

CHARLESTON, W. VA. 25311

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. **2.** Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
State of West Virginia

Street Address
212 California Ave

County
Kanawha

City: Charleston | State: WV | ZIP Code: 25305

Area Code: 304 | Phone Number: 348-3808

Type of Owner *(Mark all that apply ☒)*
- ☒ Current
- ☐ Former
- ☒ State or Local Gov't
- ☐ Federal Gov't (GSA facility I.D. no. _____)
- ☐ Private or Corporate
- ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☒)

Facility Name or Company Site Identifier, as applicable
Dept. of Fin. & Admin. Transportation Div

Street Address or State Road, as applicable
212 California Ave

County
Kanawha

City (nearest): Charleston | State: WV | ZIP Code: 25305

Indicate number of tanks at this location: 2

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐): Ronald W. DuKate
Job Title: Director of Transportation
Area Code: 304 | Phone Number: 348-3808

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative: Ronald W. DuKate Director, Transptn. Div
Signature: Ronald W. DuKate
Date Signed: 10-28-86

CONTINUE ON REVERSE SIDE

Owner Name (from Section I) State of West Virginia Location (from Section II) ~~212 California Ave~~ Charleston, WV Page No. 2 of 2 Pages

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS *(Complete for each tank at this location.)*

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)	Tank No. 1	Tank No. 2	Tank No.	Tank No.	Tank No.
1. Status of Tank *(Mark all that apply ☒)* — Currently in Use	X	X			
Temporarily Out of Use					
Permanently Out of Use					
Brought into Use after 5/8/86					
2. Estimated Age (Years)	2	18			
3. Estimated Total Capacity (Gallons)	6,000	6,000			
4. Material of Construction *(Mark one ☒)* — Steel	X	X			
Concrete					
Fiberglass Reinforced Plastic					
Unknown					
Other, Please Specify					
5. Internal Protection *(Mark all that apply ☒)* — Cathodic Protection					
Interior Lining (e.g., epoxy resins)					
None					
Unknown	X	X			
Other, Please Specify					
6. External Protection *(Mark all that apply ☒)* — Cathodic Protection					
Painted (e.g., asphaltic)					
Fiberglass Reinforced Plastic Coated					
None					
Unknown	X	X			
Other, Please Specify					
7. Piping *(Mark all that apply ☒)* — Bare Steel					
Galvanized Steel					
Fiberglass Reinforced Plastic					
Cathodically Protected					
Unknown	X	X			
Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume *(Mark all that apply ☒)* — **a. Empty**					
b. Petroleum	X	X			
Diesel					
Kerosene					
Gasoline (including alcohol blends)	X	X			
Used Oil					
Other, Please Specify					
c. Hazardous Substance					
Please Indicate Name of Principal CERCLA Substance					
OR Chemical Abstract Service (CAS) No.					
Mark box ☒ if tank stores a mixture of substances					
d. Unknown					
9. Additional Information (for tanks permanently taken out of service)					
a. Estimated date last used (mo/yr)	/	/	/	/	/
b. Estimated quantity of substance remaining (gal.)					
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)					

STATE OF WEST VIRGINIA
DEPARTMENT OF FINANCE AND ADMINISTRATION

State Capitol
Charleston, WV 25305

Arch A. Moore, Jr.
Governor

John F. McCuskey
Commissioner

MEMORANDUM

TO: Mr. Ronald A. Shipley
Division of Waste Management
Dept. of Natural Resources

FROM: Ronald W. DuKate, Director
Transportation Division

DATE: October 28, 1986

SUBJECT: Underground Storage Tanks

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

OCT 29 1986

1260 GREENBRIER STREET
CHARLESTON, W. VA. 25311

Forwarded is a West Virginia EPA form as required by new Federal laws notifying your agency of the existence of two (2) underground storage tanks.

If you need more information, please do not hesitate to call me.

RWD:eh

Enclosure

APPENDIX D

ENVIRONMENTAL DATABASE INFORMATION

N2207015
302 Jefferson Street
Charleston, WV 25311

Inquiry Number: 6073152.2s
May 26, 2020

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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Physical Setting Source Records Searched	PSGR-1

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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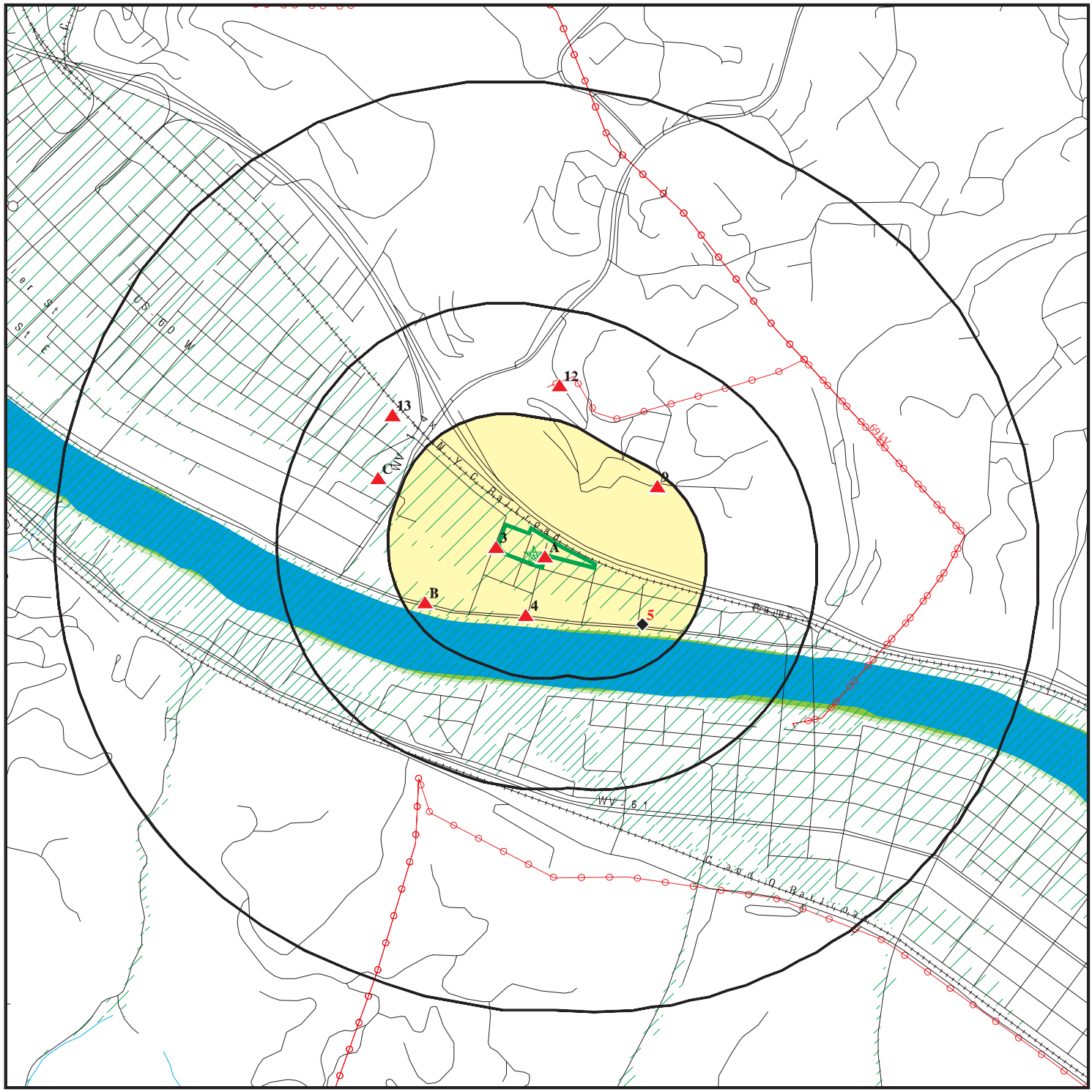
MAPPED SITES SUMMARY

Target Property Address:
302 JEFFERSON STREET
CHARLESTON, WV 25311

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
A1	M C S & T DIVISION 0	312 MICHIGAN AVE	WV UST	Higher	1 ft.
A2	WVDOH MCST DIVISION	312 MICHIGAN AVE	RCRA NonGen / NLR, ECHO	Higher	1 ft.
3	DOH CENTRAL MOTOR PO	212 CALIFORNIA AVE	WV UST	Higher	37, 0.007, WNW
4	EASTERN STATES OIL &	1 MI N BAKERS ROAD	RCRA NonGen / NLR, ECHO	Higher	592, 0.112, South
5	CHESAPEAKE LIGHT AND	2406 KANAWHA BOULEVA	NY MANIFEST	Lower	882, 0.167, ESE
B6	WV OFFICE OF EMERGEN	1900 KANAWHA BLVD E	WV UST	Higher	1092, 0.207, WSW
B7	WVDOH - OFFICE SERVI	1900 KANAWHA BLVD BL	RCRA NonGen / NLR	Higher	1092, 0.207, WSW
B8	WV DEPT. OF ADMINIST	1900 KANAWHA BLVD E	RCRA-VSQG, FINDS	Higher	1092, 0.207, WSW
9	DIVERSIFIEDSOUTHERN	1 HILLCREST DRIVE EA	WV AST	Higher	1187, 0.225, ENE
C10	WV0051	1639 WASHINGTON ST E	WV LUST, WV UST, WV Financial Assurance	Higher	1415, 0.268, WNW
C11	7-ELEVEN 35904	1630 WASHINGTON ST E	WV LUST, WV UST, WV Financial Assurance	Higher	1611, 0.305, WNW
12	MCJUNKIN CORP	835 HILLCREST DR	WV LUST, WV UST	Higher	1735, 0.329, North
13	DONS DISPOSAL SERVIC	CRAIGS BRANCH ROAD	SEMS, RCRA NonGen / NLR, ECHO	Higher	1872, 0.355, NW

OVERVIEW MAP - 6073152.2S



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

National Priority List Sites

Dept. Defense Sites

0 1/4 1/2 1 Miles

Indian Reservations BIA

Power transmission lines

Special Flood Hazard Area (1%)

0.2% Annual Chance Flood Hazard

National Wetland Inventory

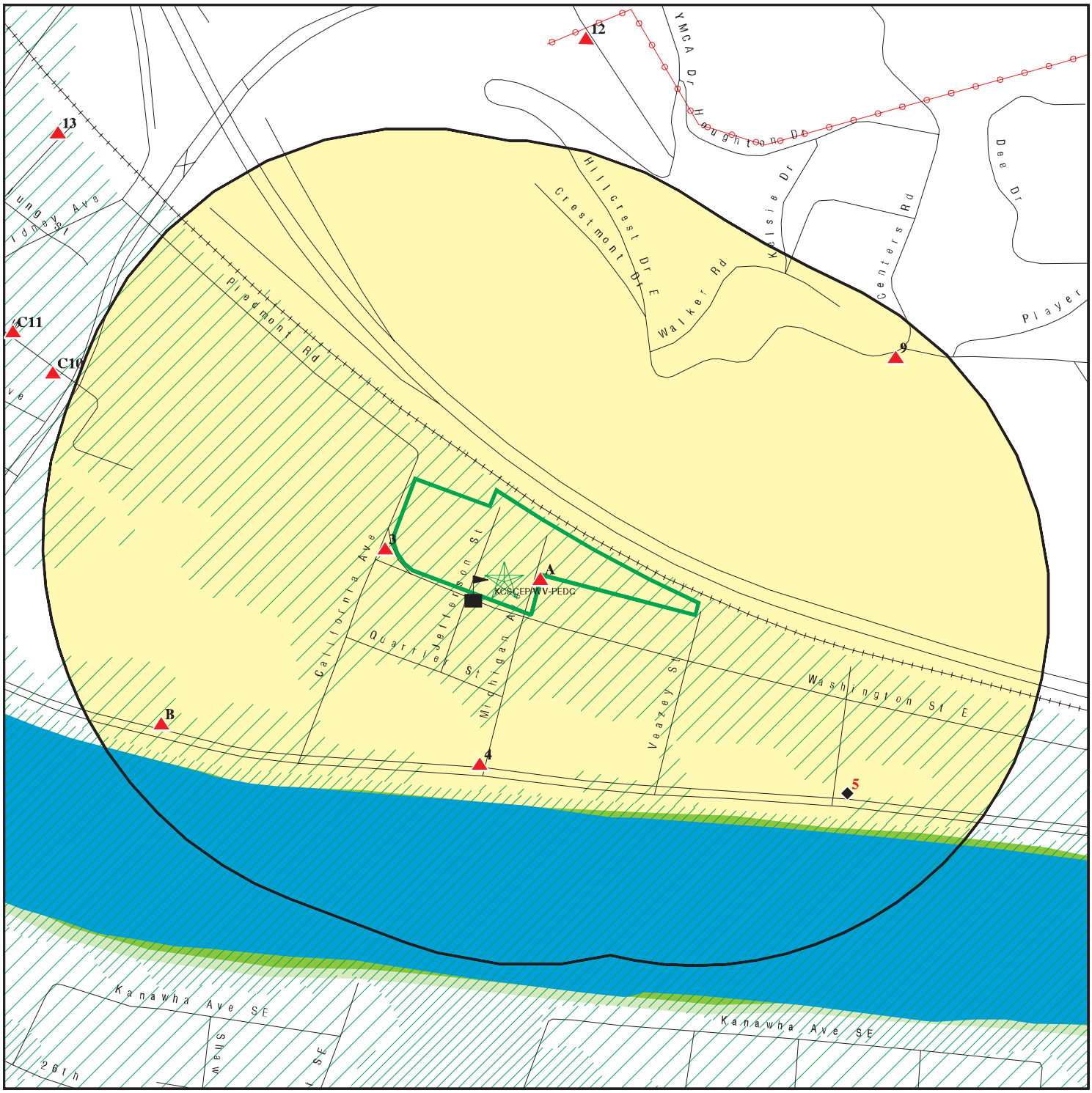
State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	N2207015	CLIENT:	Terracon
ADDRESS:	302 Jefferson Street Charleston WV 25311	CONTACT:	Levi Sheff
		INQUIRY #:	6073152.2s
LAT/LONG:	38.337069 / 81.608436	DATE:	May 26, 2020 9:57 am

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DETAIL MAP - 6073152.2S



0 1/16 1/8 1/4 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Special Flood Hazard Area (1%)
- 0.2% Annual Chance Flood Hazard
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: N2207015	CLIENT: Terracon
ADDRESS: 302 Jefferson Street Charleston WV 25311	CONTACT: Levi Sheff
LAT/LONG: 38.337069 / 81.608436	INQUIRY #: 6073152.2s DATE: May 26, 2020 9:59 am

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	1	NR	NR	1
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-VSQG	0.250		0	1	NR	NR	NR	1
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROLS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent CERCLIS								
WV SHWS	N/A		N/A	N/A	N/A	N/A	N/A	N/A
State and tribal landfill and/or solid waste disposal site lists								
WV SWF/LF	0.500		0	0	0	NR	NR	0
WV LCP	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
WV LUST	0.500		0	0	3	NR	NR	3
WV LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
WV UST	0.250		2	1	NR	NR	NR	3
WV AST	0.250		0	1	NR	NR	NR	1
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
WV INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
WV VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
WV BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
INDIAN ODI	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
WV CDL	TP		NR	NR	NR	NR	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
WV SPILLS	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		2	1	NR	NR	NR	3
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
WV MINES	0.250		0	0	NR	NR	NR	0
WV AIRS	TP		NR	NR	NR	NR	NR	0
WV ASBESTOS	TP		NR	NR	NR	NR	NR	0
WV COAL ASH	0.500		0	0	0	NR	NR	0
WV DRYCLEANERS	0.250		0	0	NR	NR	NR	0
WV Financial Assurance	TP		NR	NR	NR	NR	NR	0
NY MANIFEST	0.250		0	1	NR	NR	NR	1
WV NPDES	TP		NR	NR	NR	NR	NR	0
WV UIC	TP		NR	NR	NR	NR	NR	0
MINES MRDS	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
WV RGA LF	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
WV RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	4	5	4	0	0	13

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

N/A = This State does not maintain a SHWS list. See the Federal CERCLIS list.

A1 **M C S & T DIVISION 00771** **WV UST** **U003760859**
312 MICHIGAN AVE **N/A**
< 1/8 **CHARLESTON, WV 25301**
1 ft.

Site 1 of 2 in cluster A

Relative: UST:
Higher

Actual:
601 ft.

Name:	M C S & T DIVISION 00771
Address:	312 MICHIGAN AVE
City:	CHARLESTON
Facility ID:	2002608
Owner:	WV DIVISION OF HIGHWAYS
Owner Address:	EQUIP DIV ATT DON WEESE
Owner Address 2:	PO BOX 610
Owner City,St,Zip:	BUCKHANNON, WV 26201
Owner Telephone:	(304) 472-1750
Tank ID:	-1
Tank Status:	**Permanently Out of Service**
Tank Substance:	Gasoline
Tank Capacity:	6000
Date Last Used:	01/15/1990
Date Closed:	01/15/1990
Closure Status:	Tank removed from ground
Tank Material:	Asphalt Coated or Bare Steel
Piping Material:	Unknown
Overfill Installed:	No
Installed Spill Protection:	No
Cathodic Protection Method:	No
Compartment:	1
Tank ID:	-2
Tank Status:	**Permanently Out of Service**
Tank Substance:	Used Oil
Tank Capacity:	1000
Date Last Used:	05/08/1992
Date Closed:	06/13/1992
Closure Status:	Tank removed from ground
Tank Material:	Asphalt Coated or Bare Steel
Piping Material:	Unknown
Overfill Installed:	No
Installed Spill Protection:	No
Cathodic Protection Method:	No
Compartment:	1

A2 **WVDOH MCST DIVISION** **RCRA NonGen / NLR** **1000394225**
312 MICHIGAN AVE **ECHO** **WVD981936297**
< 1/8 **CHARLESTON, WV 25305**
1 ft.

Site 2 of 2 in cluster A

Relative: RCRA NonGen / NLR:
Higher

Actual:
601 ft.

Date form received by agency:	2003-05-05 00:00:00.0
Facility name:	WVDOH MCST DIVISION
Facility address:	312 MICHIGAN AVE CHARLESTON, WV 25305
EPA ID:	WVD981936297
Contact:	R HANLON
Contact address:	312 MICHIGAN AVE

WVDOH MCST DIVISION (Continued) **1000394225**

CHARLESTON, WV 25305
Contact country: US
Contact telephone: 304-348-3014
EPA Region: 03
Land type: Facility is not located on Indian land. Additional information is not known.
Classification: Non-Generator
Description: Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:
Owner/operator name: VIRGINIA LAND COMPANY
Owner/operator address: OWNERSTREET
OWNERCITY, AK 99999
Owner/operator telephone: 215-555-1212
Legal status: Private
Owner/Operator Type: Owner

Owner/operator name: OPERNAME
Owner/operator address: OPERSTREET
OPERCITY, AK 99999
Owner/operator telephone: 215-555-1212
Legal status: Private
Owner/Operator Type: Operator

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 1987-03-16 00:00:00.0
Site name: WEST VA DEPT OF HIGHWAYS MCST DIV
Classification: Small Quantity Generator

Hazardous Waste Summary:

. Waste code: F002
. Waste name: THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE, TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE, CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2, TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F004, AND

WVDOH MCST DIVISION (Continued) **1000394225**

F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

Evaluation Action Summary:
Evaluation date: 2003-04-08 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Evaluation lead agency: State

Evaluation date: 1991-05-23 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Evaluation lead agency: State

ECHO:
Envid: 1000394225
Registry ID: 110070634190
DFR URL: http://echo.epa.gov/detailed-facility-report?fid=110070634190
Name: WVDOH MCST DIVISION
Address: 312 MICHIGAN AVE
City,State,Zip: CHARLESTON, WV 25305

3
WNW
< 1/8
0.007 mi.
37 ft.

DOH CENTRAL MOTOR POOL 01701 **WV UST** **U003760775**
212 CALIFORNIA AVE **N/A**
CHARLESTON, WV 25305

Relative:
Higher

Actual:
599 ft.

UST:
Name: DOH CENTRAL MOTOR POOL 01701
Address: 212 CALIFORNIA AVE
City: CHARLESTON
Facility ID: 2002051
Owner: WV DIVISION OF HIGHWAYS
Owner Address: EQUIP DIV ATT DON WEESE
Owner Address 2: PO BOX 610
Owner City,St,Zip: BUCKHANNON, WV 26201

DOH CENTRAL MOTOR POOL 01701 (Continued) **U003760775**

Owner Telephone: (304) 472-1750

Tank ID: -1
Tank Status: Permanently Out of Service
Tank Substance: Gasoline
Tank Capacity: 6000
Date Last Used: 01/09/1992
Date Closed: 02/01/1992
Closure Status: Tank removed from ground
Tank Material: Asphalt Coated or Bare Steel
Piping Material: Unprotected Steel
Overfill Installed: No
Installed Spill Protection: No
Cathodic Protection Method: No
Compartment: 1

Tank ID: -2
Tank Status: Permanently Out of Service
Tank Substance: Gasoline
Tank Capacity: 6000
Date Last Used: 06/25/1998
Date Closed: 06/25/1998
Closure Status: Tank removed from ground
Tank Material: Asphalt Coated or Bare Steel
Piping Material: Unprotected Steel
Overfill Installed: No
Installed Spill Protection: No
Cathodic Protection Method: No
Compartment: 1

Tank ID: -3
Tank Status: Permanently Out of Service
Tank Substance: Gasoline
Tank Capacity: 4000
Date Last Used: 06/25/1998
Date Closed: 06/25/1998
Closure Status: Tank removed from ground
Tank Material: Fiberglass Reinforced Plastic
Piping Material: Fiberglass Reinforced Plastic
Overfill Installed: Yes
Installed Spill Protection: Yes
Cathodic Protection Method: Yes
Compartment: 1

Tank ID: -4
Tank Status: Permanently Out of Service
Tank Substance: Used Oil
Tank Capacity: 500
Date Last Used: 06/25/1998
Date Closed: 06/25/1998
Closure Status: Tank removed from ground
Tank Material: Asphalt Coated or Bare Steel
Piping Material: Unprotected Steel
Overfill Installed: No

DOH CENTRAL MOTOR POOL 01701 (Continued) **U003760775**

Installed Spill Protection: No
Cathodic Protection Method: No
Compartment: 1

4
South
< 1/8
0.112 mi.
592 ft.

EASTERN STATES OIL & GAS **RCRA NonGen / NLR** **1000921369**
1 MI N BAKERS ROAD **ECHO** **WV0000561829**
CHARLESTON, WV 25311

Relative:
Higher

Actual:
605 ft.

RCRA NonGen / NLR:
Date form received by agency: 1998-09-03 00:00:00.0
Facility name: EASTERN STATES OIL & GAS
Facility address: 1 MI N BAKERS ROAD
& RUTLEDGE RD INTERSECTION
CHARLESTON, WV 25311
EPA ID: WV0000561829
Mailing address: RR6 BOX 178 RUTLEDGE ROAD
CHARLESTON, WV 25311
Contact: KATE BLIZZARD
Contact address: 1710 PENNSYLVANIA AVE
CHARLESTON, WV 25302
Contact country: US
Contact telephone: 304-357-9237
EPA Region: 03
Land type: Private
Classification: Non-Generator
Description: Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:
Owner/operator name: EASTERN STATES OIL & GAS
Owner/operator address: 1710 PENNSYLVANIA AVE
CHARLESTON, WV 25302
Owner/operator telephone: 800-926-1759
Legal status: Private
Owner/Operator Type: Owner

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 1994-07-28 00:00:00.0

EASTERN STATES OIL & GAS (Continued) **1000921369**

Site name: EASTERN STATES OIL & GAS
Classification: Conditionally Exempt Small Quantity Generator

Hazardous Waste Summary:

. Waste code: D000
. Waste name: Not Defined

. Waste code: D009
. Waste name: MERCURY

Facility Has Received Notices of Violations:
Regulation violated: SR - 33 CSR 20 Apx. 1 2.7.b 13
Area of violation: Generators - General
Date violation determined: 1998-07-14 00:00:00.0
Date achieved compliance: 1998-11-18 00:00:00.0
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 1998-07-14 00:00:00.0
Enforcement lead agency: State

Regulation violated: SR - 33 CSR 20 Apx. 1 2.2
Area of violation: Generators - General
Date violation determined: 1998-07-14 00:00:00.0
Date achieved compliance: 1998-11-18 00:00:00.0
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 1998-07-14 00:00:00.0
Enforcement lead agency: State

Regulation violated: SR - 33 CSR 20 Apx. 1 2.3
Area of violation: Generators - General
Date violation determined: 1998-07-14 00:00:00.0
Date achieved compliance: 1998-11-18 00:00:00.0
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 1998-07-14 00:00:00.0
Enforcement lead agency: State

Regulation violated: SR - 33 CSR 20 Apx. 1 2.7.b 14
Area of violation: Used Oil - Processors and Re-refiners
Date violation determined: 1998-07-14 00:00:00.0
Date achieved compliance: 1998-11-18 00:00:00.0
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 1998-07-14 00:00:00.0
Enforcement lead agency: State

Regulation violated: SR - 33 CSR 20 Apx. 1 2.6
Area of violation: Generators - Pre-transport
Date violation determined: 1998-07-14 00:00:00.0
Date achieved compliance: 1998-11-18 00:00:00.0
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 1998-07-14 00:00:00.0
Enforcement lead agency: State

EASTERN STATES OIL & GAS (Continued) **1000921369**

Regulation violated: SR - 33 CSR 20 Apx. 1 2.5
Area of violation: Generators - Manifest
Date violation determined: 1998-07-14 00:00:00.0
Date achieved compliance: 1998-11-18 00:00:00.0
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 1998-07-14 00:00:00.0
Enforcement lead agency: State

Evaluation Action Summary:
Evaluation date: 1998-07-14 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - General
Date achieved compliance: 1998-11-18 00:00:00.0
Evaluation lead agency: State

Evaluation date: 1998-07-14 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - Pre-transport
Date achieved compliance: 1998-11-18 00:00:00.0
Evaluation lead agency: State

Evaluation date: 1998-07-14 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Used Oil - Processors and Re-refiners
Date achieved compliance: 1998-11-18 00:00:00.0
Evaluation lead agency: State

Evaluation date: 1998-07-14 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - Manifest
Date achieved compliance: 1998-11-18 00:00:00.0
Evaluation lead agency: State

ECHO:
Envid: 1000921369
Registry ID: 110070637741
DFR URL: http://echo.epa.gov/detailed-facility-report?fid=110070637741
Name: EASTERN STATES OIL & GAS
Address: 1 MI N BAKERS ROAD
City,State,Zip: CHARLESTON, WV 25311

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5 **CHESAPEAKE LIGHT AND WATER COMPANY** **NY MANIFEST** **1009247977**
ESE **2406 KANAWHA BOULEVARD** **N/A**
1/8-1/4 **CHARLESTON, WV 25311**
0.167 mi.
882 ft.

Relative: **Lower**
Actual: **597 ft.**

NY MANIFEST:
Name: CHESAPEAKE LIGHT AND WATER COMPANY
Address: 2406 KANAWHA BOULEVARD
City,State,Zip: CHARLESTON, WV 25311
Country: USA
EPA ID: WVP000000581
Location Address 1: 2406 KANAWHA BOULEVARD
Code: BP
Location City: CHARLESTON

CHESAPEAKE LIGHT AND WATER COMPANY (Continued) **1009247977**

Location State: WV
Location Zip: 25311

NY MANIFEST:
EPAID: WVP000000581
Mailing Name: CHESAPEAKE LIGHT AND WATER COMPANY
Mailing Contact: CHESAPEAKE LIGHT AND WATER COMPANY
Mailing Address 1: 2406 KANAWHA BOULEVARD
Mailing City: CHARLESTON
Mailing State: WV
Mailing Zip: 25311
Mailing Country: USA
Mailing Phone: 3043427075

NY MANIFEST:
Document ID: NYA1183095
Manifest Status: K
Year: 1985
Generator Ship Date: 04/22/1985
Trans1 Recv Date: 04/22/1985
Trans2 Recv Date: / /
TSD Site Recv Date: 04/24/1985
Part A Recv Date: 10/03/1985
Part B Recv Date: 04/29/1985
Generator EPA ID: WVP000000581
Trans1 EPA ID: OHD087433744
TSDF ID 1: NYD080336241
Waste Code: B004 - PCB ARTICLES WITH 50 PPM BUT < 500 PPM
Quantity: 00164
Units: T - Tons
Number of Containers: 001
Container Type: DT - Dump trucks
Handling Method: L Landfill.
Specific Gravity: 100

B6 **WV OFFICE OF EMERGENCY SERVICES** **WV UST** **U003760998**
WSW **1900 KANAWHA BLVD E** **N/A**
1/8-1/4 **CHARLESTON, WV 25305**
0.207 mi.
1092 ft. **Site 1 of 3 in cluster B**

Relative:
Higher

Actual:
601 ft.

UST:
Name: WV OFFICE OF EMERGENCY SERVICES
Address: 1900 KANAWHA BLVD E
City: CHARLESTON
Facility ID: 2009801
Owner: WV OFFICE OF EMERGENCY SERVICES
Owner Address: 1900 KANAWHA BLVD E
Owner City,St,Zip: CHARLESTON, WV 25305
Owner Telephone: (304) 558-5380

Tank ID: -1
Tank Status: **Permanently Out of Service**
Tank Substance: Diesel
Tank Capacity: 3000
Date Last Used: 06/08/1999
Date Closed: 09/27/1999

WV OFFICE OF EMERGENCY SERVICES (Continued) **U003760998**

Closure Status:	Tank removed from ground
Tank Material:	Asphalt Coated or Bare Steel
Piping Material:	Unprotected Steel
Overfill Installed:	No
Installed Spill Protection:	No
Cathodic Protection Method:	No
Compartment:	1
Latitude:	38.336829
Longitude:	81.610865

Tank ID:	2
Tank Status:	**Currently In Use**
Tank Substance:	Diesel
Tank Capacity:	1000
Closure Status:	Not listed
Tank Material:	Composite - Double Walled
Piping Material:	Fiberglass Reinforced Plastic
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	1
Latitude:	38.336829
Longitude:	81.610865

B7 **WVDOH - OFFICE SERVICES** **RCRA NonGen / NLR** **1004803452**
WSW **1900 KANAWHA BLVD BLDG 5** **WVR000001057**
1/8-1/4 **CHARLESTON, WV 25305**
0.207 mi.
1092 ft. **Site 2 of 3 in cluster B**

Relative:
Higher

Actual:
601 ft.

RCRA NonGen / NLR:

Date form received by agency:	2017-04-26 00:00:00.0
Facility name:	WVDOH - OFFICE SERVICES
Facility address:	1900 KANAWHA BLVD BLDG 5 ROOM 148 CHARLESTON, WV 25305
EPA ID:	WVR000001057
Mailing address:	1900 KANAWHA BLVD E BLDG 5 ROOM 148 CHARLESTON, WV 25305-0430
Contact:	AMECHE WATSON
Contact address:	1900 KANAWHA BLVD E BLD 5, ROOM 148 CHARLESTON, WV 25305-0430
Contact country:	US
Contact telephone:	304-558-9216
Contact email:	AMECHE.L.WATSON@WV.GOV
EPA Region:	03
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	WV DEPT OF TRANSPORTATION RM011
Owner/operator address:	1900 KANAWHA BLVD BLDG 5 CHARLESTON, WV 25305
Owner/operator country:	US
Owner/operator telephone:	304-558-3106

WVDOH - OFFICE SERVICES (Continued) **1004803452**

Legal status: State
Owner/Operator Type: Operator
Owner/Op start date: 1998-01-01 00:00:00.

Owner/operator name: WV DEPT OF TRANSPORTATION RM011
Owner/operator address: 1900 KANAWHA BLVD BLDG 5
CHARLESTON, WV 25305
Owner/operator country: US
Owner/operator telephone: 304-558-3106
Legal status: State
Owner/Operator Type: Owner
Owner/Op start date: 1995-03-30 00:00:00.

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 2016-06-13 00:00:00.0
Site name: WVDOH OFFICE SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2015-05-21 00:00:00.0
Site name: WVDOH OFFICE SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2012-10-23 00:00:00.0
Site name: WVDOH OFFICE SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2009-11-03 00:00:00.0
Site name: WVDOH OFFICE SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2006-09-12 00:00:00.0
Site name: WVDOH - OFFICE SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 1995-03-30 00:00:00.0
Site name: WVDOH - OFFICE SERVICES
Classification: Conditionally Exempt Small Quantity Generator

WVDOH - OFFICE SERVICES (Continued) **1004803452**

Hazardous Waste Summary:

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

Violation Status: No violations found

B8 **WV DEPT. OF ADMINISTRATION, GENERAL SERVICES DIV** **RCRA-VSQG** **1016452839**
WSW **1900 KANAWHA BLVD E BLDG 1** **FINDS** **WVR000530402**
1/8-1/4 **CHARLESTON, WV 25305**
0.207 mi.
1092 ft. **Site 3 of 3 in cluster B**

Relative:
Higher

Actual:
601 ft.

RCRA-VSQG:
Date form received by agency: 2019-10-18 00:00:00.0
Facility name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Facility address: 1900 KANAWHA BLVD E BLDG 1
CAPITOL COMPLEX
CHARLESTON, WV 25305
EPA ID: WVR000530402
Mailing address: 112 CALIFORNIA AVE, BLDG 4
5TH FLOOR
CHARLESTON, WV 25305
Contact: JONATHAN TROUT
Contact address: 112 CALIFORNIA AVE, BLDG 4 5TH FLOOR
CHARLESTON, WV 25305
Contact country: US
Contact telephone: 304-957-7153
Contact email: JONATHAN.R.TRENT@WV.GOV
EPA Region: 03
Land type: State
Classification: Conditionally Exempt Small Quantity Generator
Description: Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:
Owner/operator name: GENERAL SERVICES DIVISION
Owner/operator address: 1900 KANAWHA BLVD E
CHARLESTON, WV 25305
Owner/operator country: US
Owner/operator telephone: 304-558-4331
Legal status: State
Owner/Operator Type: Operator

WV DEPT. OF ADMINISTRATION, GENERAL SERVICES DIV (Continued) **1016452839**

Owner/Op start date: 1960-01-01 00:00:00.

Owner/operator name: WV DEPARTMENT OF ADMINISTRATION
Owner/operator address: 1900 KANAWHA BLVD E
CHARLESTON, WV 25305
Owner/operator country: US
Legal status: State
Owner/Operator Type: Owner
Owner/Op start date: 1960-01-01 00:00:00.

Handler Activities Summary:
U.S. importer of hazardous waste: No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 2018-09-10 00:00:00.0
Site name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2018-02-09 00:00:00.0
Site name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2016-10-21 00:00:00.0
Site name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2015-09-29 00:00:00.0
Site name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2015-02-24 00:00:00.0
Site name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Date form received by agency: 2013-10-29 00:00:00.0
Site name: WV DEPARTMENT OF ADMINISTRATION - GENERAL SERVICES
Classification: Conditionally Exempt Small Quantity Generator

Hazardous Waste Summary:

. Waste code: D001
. Waste name: IGNITABLE WASTE

WV DEPT. OF ADMINISTRATION, GENERAL SERVICES DIV (Continued) **1016452839**

Violation Status: No violations found

Evaluation Action Summary:
Evaluation date: 2018-07-18 00:00:00.0
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Evaluation lead agency: State

FINDS:
Registry ID: 110056339323
Facility URL: http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110056339323

Environmental Interest/Information System:
AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.
AIR MINOR

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

9
ENE
1/8-1/4
0.225 mi.
1187 ft.

DIVERSIFIEDSOUTHERN PRODUCTION **WV AST** **A100468933**
1 HILLCREST DRIVE EAST **N/A**
CHARLESTON, WV 25311

Relative: Higher

Actual: 1095 ft.

AST:
Name: DIVERSIFIEDSOUTHERN PRODUCTION
Address: 1 HILLCREST DRIVE EAST
City: CHARLESTON
Zip: 25311
Owner Name: DIVERSIFIED SOUTHERN PRODUCTION LLC
Owner Address: 101 MCQUISTON DR.
Owner City, State, Zip: JACKSON CENTER, PA 16133

WV DEP Tank Label: 010-00000721
Tank Status: C
Year Constructed: 2018
Install Period: 10/2018
Capacity: 4200.00
Case ID: 8028-77-1
NONCAS Chemical: Brine, oil and gas
REF_ID: 2018-0000471
Cont Email: dbyers@dgoc.com
Mobile Tank: No
Rented Tank: No
ZCC: In
WPA: Out
APC: Out
Level Class: 1

DIVERSIFIEDSOUTHERN PRODUCTION (Continued) **A100468933**

WV DEP Tank Label:	020-00003383
Tank Status:	C
Year Constructed:	2018
Install Period:	10/2018
Capacity:	4200.00
Case ID:	8028-77-1
NONCAS Chemical:	Brine, oil and gas
REF_ID:	2018-0000471
Cont Email:	dbyers@dgoc.com
Mobile Tank:	No
Rented Tank:	No
ZCC:	In
WPA:	Out
APC:	Out
Level Class:	1

WV DEP Tank Label:	020-00003384
Tank Status:	C
Year Constructed:	2018
Install Period:	10/2018
Capacity:	4200.00
Case ID:	8028-77-1
NONCAS Chemical:	Brine, oil and gas
REF_ID:	2018-0000471
Cont Email:	dbyers@dgoc.com
Mobile Tank:	No
Rented Tank:	No
ZCC:	In
WPA:	Out
APC:	Out
Level Class:	1

C10 **WV0051** **WV LUST** **U003998192**
WNW **1639 WASHINGTON ST E** **WV UST** **N/A**
1/4-1/2 **CHARLESTON, WV 25311** **WV Financial Assurance**
0.268 mi.
1415 ft. **Site 1 of 2 in cluster C**

Relative: **Higher**
Actual: **600 ft.**

LUST:

Name:	WV0051
Address:	1639 WASHINGTON ST E
City,State,Zip:	CHARLESTON, WV 25311
Facility ID:	2002319
Leak Number:	00-045
Confirmed Release Date:	06/06/2000
Cleanup Initiated Date:	04/18/2002
Cleanup Complete Date:	05/27/2016
EDR Link ID:	2-002319

Name:	WV0051
Address:	1639 WASHINGTON ST E
City,State,Zip:	CHARLESTON, WV 25311
Facility ID:	2002319
Leak Number:	91-9949-L20
Confirmed Release Date:	11/07/1991
Cleanup Initiated Date:	11/07/1991
Cleanup Complete Date:	11/27/1991
EDR Link ID:	2-002319

WV0051 (Continued) **U003998192**

UST:

Name:	WV0051
Address:	1639 WASHINGTON ST E
City:	CHARLESTON
Facility ID:	2002319
Owner:	M & J OPERATIONS, LLC
Owner Address:	515 HAMILTON STREET, SUITE 200
Owner City,St,Zip:	ALLENTOWN, PA 18101
Owner Telephone:	304-720-7133
Tank ID:	-5
Tank Status:	**Permanently Out of Service**
Tank Substance:	Used Oil
Tank Capacity:	1000
Date Last Used:	06/16/1995
Date Closed:	06/16/1995
Closure Status:	Tank removed from ground
Tank Material:	Fiberglass Reinforced Plastic
Piping Material:	Fiberglass Reinforced Plastic
Overfill Installed:	No
Installed Spill Protection:	No
Cathodic Protection Method:	Yes
Compartment:	1
Latitude:	38.339177
Longitude:	81.614643
Tank ID:	1
Tank Status:	**Currently In Use**
Tank Substance:	Gasoline
Tank Capacity:	10000
Closure Status:	Not listed
Tank Material:	Fiberglass Reinforced Plastic
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	1
Latitude:	38.339177
Longitude:	81.614643
Tank ID:	2
Tank Status:	**Currently In Use**
Tank Substance:	Gasoline
Tank Capacity:	8000
Closure Status:	Not listed
Tank Material:	Fiberglass Reinforced Plastic
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	1
Latitude:	38.339177
Longitude:	81.614643
Tank ID:	3
Tank Status:	**Currently In Use**

WV0051 (Continued) **U003998192**

Tank Substance:	Gasoline
Tank Capacity:	6000
Closure Status:	Not listed
Tank Material:	Fiberglass Reinforced Plastic
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	1
Latitude:	38.339177
Longitude:	81.614643

Tank ID:	4
Tank Status:	**Currently In Use**
Tank Substance:	Diesel
Tank Capacity:	10000
Closure Status:	Not listed
Tank Material:	Fiberglass Reinforced Plastic
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	1
Latitude:	38.339177
Longitude:	81.614643

WV Financial Assurance:

Policy:	BTA5599845-07
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2012
End Date:	10/01/2013
Policy Name:	GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled

Policy:	BTA5599845-07
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	2
Tank Capacity:	8000
Begin Date:	10/01/2012
End Date:	10/01/2013
Policy Name:	GREAT AMERICAN ALLIANCE INSURANCE COMPANY

WV0051 (Continued) **U003998192**

Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA5599845-07
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2012
End Date: 10/01/2013
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845-05
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 4
Tank Capacity: 10000
Begin Date: 10/01/2010
End Date: 10/01/2011
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845-05
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2010
End Date: 10/01/2011
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES

WV0051 (Continued) **U003998192**

Pipe Option:	Double-Walled
Policy:	BTA 5599845-05
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	2
Tank Capacity:	8000
Begin Date:	10/01/2010
End Date:	10/01/2011
Policy Name:	GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	BTA 5599845-05
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2010
End Date:	10/01/2011
Policy Name:	GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	5599845-06
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	4
Tank Capacity:	10000
Begin Date:	10/01/2011
End Date:	10/01/2012
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	5599845-06

WV0051 (Continued) **U003998192**

Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2011
End Date: 10/01/2012
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: 5599845-06
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 2
Tank Capacity: 8000
Begin Date: 10/01/2011
End Date: 10/01/2012
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: 5599845-06
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 1
Tank Capacity: 10000
Begin Date: 10/01/2011
End Date: 10/01/2012
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE

WV0051 (Continued) **U003998192**

Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 4
Tank Capacity: 10000
Begin Date: 10/01/2005
End Date: 10/01/2006
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2005
End Date: 10/01/2006
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 2
Tank Capacity: 8000
Begin Date: 10/01/2005
End Date: 10/01/2006
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301

WV0051 (Continued) **U003998192**

Owner Phone:	304-720-7133
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2005
End Date:	10/01/2006
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled

Policy:	BTA 5599845-02
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	4
Tank Capacity:	10000
Begin Date:	10/01/2008
End Date:	10/01/2009
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled

Policy:	BTA 5599845-02
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	3
Tank Capacity:	10000
Begin Date:	10/01/2008
End Date:	10/01/2009
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled

Policy:	BTA 5599845-02
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	2
Tank Capacity:	8000

WV0051 (Continued) **U003998192**

Begin Date: 10/01/2008
End Date: 10/01/2009
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845-02
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 1
Tank Capacity: 10000
Begin Date: 10/01/2008
End Date: 10/01/2009
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 523701901
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 4
Tank Capacity: 10000
Begin Date: 10/01/2003
End Date: 10/01/2004
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 523701901
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2003
End Date: 10/01/2004
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY

WV0051 (Continued) **U003998192**

Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 523701901
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 2
Tank Capacity: 8000
Begin Date: 10/01/2003
End Date: 10/01/2004
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 523701901
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 1
Tank Capacity: 10000
Begin Date: 10/01/2003
End Date: 10/01/2004
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845-04
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2009
End Date: 10/01/2010
Policy Name: GREAT AMERICAN E&S INSURANCE CO
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES

WV0051 (Continued) **U003998192**

Pipe Option:	Double-Walled
Policy:	BTA 5599845-04
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	2
Tank Capacity:	8000
Begin Date:	10/01/2009
End Date:	10/01/2010
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	BTA 5599845-04
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2009
End Date:	10/01/2010
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	BTA 5237019-02
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	4
Tank Capacity:	10000
Begin Date:	10/01/2004
End Date:	10/01/2005
Policy Name:	GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	BTA 5237019-02

WV0051 (Continued) **U003998192**

Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 3
Tank Capacity: 10000
Begin Date: 10/01/2004
End Date: 10/01/2005
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5237019-02
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 2
Tank Capacity: 8000
Begin Date: 10/01/2004
End Date: 10/01/2005
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA5599845-07
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE
Owner City: CHARLESTON
Owner State: WV
Owner Zip: 25301
Owner Phone: 304-720-7133
Tank Id #: 4
Tank Capacity: 10000
Begin Date: 10/01/2012
End Date: 10/01/2013
Policy Name: GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material: Fiberglass Reinforced Plastic
Tank Option: None
Pipe Material: OPW/PISCES
Pipe Option: Double-Walled

Policy: BTA 5599845-04
Id #: 2-002319
Owner Name: M & J OPERATIONS LLC
Owner Address: 412 TENNESSEE AVE

WV0051 (Continued) **U003998192**

Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	4
Tank Capacity:	10000
Begin Date:	10/01/2009
End Date:	10/01/2010
Policy Name:	GREAT AMERICAN E&S INSURANCE CO
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled
Policy:	BTA 5237019-02
Id #:	2-002319
Owner Name:	M & J OPERATIONS LLC
Owner Address:	412 TENNESSEE AVE
Owner City:	CHARLESTON
Owner State:	WV
Owner Zip:	25301
Owner Phone:	304-720-7133
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2004
End Date:	10/01/2005
Policy Name:	GREAT AMERICAN ALLIANCE INSURANCE COMPANY
Tank Material:	Fiberglass Reinforced Plastic
Tank Option:	None
Pipe Material:	OPW/PISCES
Pipe Option:	Double-Walled

C11 **7-ELEVEN 35904** **WV LUST** **U003436575**
WNW **1630 WASHINGTON ST E** **WV UST** **N/A**
1/4-1/2 **CHARLESTON, WV 25311** **WV Financial Assurance**
0.305 mi.
1611 ft. **Site 2 of 2 in cluster C**

Relative: LUST:
Higher

Name:	7-ELEVEN 35904
Address:	1630 WASHINGTON ST E
City,State,Zip:	CHARLESTON, WV 25311
Facility ID:	2002536
Leak Number:	05-058
Confirmed Release Date:	09/30/2005
Cleanup Initiated Date:	09/30/2005
EDR Link ID:	2-002536

Actual:
601 ft.

Name:	7-ELEVEN 35904
Address:	1630 WASHINGTON ST E
City,State,Zip:	CHARLESTON, WV 25311
Facility ID:	2002536
Leak Number:	06-061
Confirmed Release Date:	10/08/2006
Cleanup Initiated Date:	10/08/2006
Cleanup Complete Date:	11/08/2007
EDR Link ID:	2-002536

7-ELEVEN 35904 (Continued) **U003436575**

Name: 7-ELEVEN 35904
Address: 1630 WASHINGTON ST E
City,State,Zip: CHARLESTON, WV 25311
Facility ID: 2002536
Leak Number: 93-330
Confirmed Release Date: 10/21/1993
Cleanup Initiated Date: 01/10/1995
Cleanup Complete Date: 02/25/2008
EDR Link ID: 2-002536

UST:
Name: 7-ELEVEN 35904
Address: 1630 WASHINGTON ST E
City: CHARLESTON
Facility ID: 2002536
Owner: 7-ELEVEN, INC.
Owner Address: ATTN: GASOLINE ACCOUNTING
Owner Address 2: PO BOX 711
Owner City,St,Zip: DALLAS, TX 75221 0711
Owner Telephone: 972-828-1100

Tank ID: -1
Tank Status: **Permanently Out of Service**
Tank Substance: Gasoline
Tank Capacity: 10000
Date Last Used: 01/01/1995
Date Closed: 01/01/1995
Closure Status: Tank removed from ground
Tank Material: Asphalt Coated or Bare Steel
Piping Material: Unprotected Steel
Overfill Installed: No
Installed Spill Protection: No
Cathodic Protection Method: No
Compartment: 1

Tank ID: -2
Tank Status: **Permanently Out of Service**
Tank Substance: Gasoline
Tank Capacity: 10000
Date Last Used: 01/01/1995
Date Closed: 01/01/1995
Closure Status: Tank removed from ground
Tank Material: Asphalt Coated or Bare Steel
Piping Material: Unprotected Steel
Overfill Installed: No
Installed Spill Protection: No
Cathodic Protection Method: No
Compartment: 1

Tank ID: -3
Tank Status: **Permanently Out of Service**
Tank Substance: Gasoline
Tank Capacity: 10000
Date Last Used: 01/01/1995
Date Closed: 01/01/1995

7-ELEVEN 35904 (Continued) **U003436575**

Closure Status:	Tank removed from ground
Tank Material:	Asphalt Coated or Bare Steel
Piping Material:	Unprotected Steel
Overfill Installed:	No
Installed Spill Protection:	No
Cathodic Protection Method:	No
Compartment:	1

Tank ID:	1
Tank Status:	**Currently In Use**
Tank Substance:	Gasoline
Tank Capacity:	10000
Closure Status:	Not listed
Tank Material:	Polyethylene Tank Jacket
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	1

Tank ID:	2
Tank Status:	**Currently In Use**
Tank Substance:	Gasoline
Tank Capacity:	12000
Closure Status:	Not listed
Tank Material:	Polyethylene Tank Jacket
Overfill Installed:	Yes
Installed Spill Protection:	Yes
Cathodic Protection Method:	Yes
Compartment:	2

WV Financial Assurance:

Policy:	G23879670 001
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2010
End Date:	10/01/2011
Policy Name:	ILLINOIS UNION INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled

Policy:	USC 3511205-09
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711

7-ELEVEN 35904 (Continued) **U003436575**

Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2009
End Date:	10/01/2010
Policy Name:	ZURICH INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	USC 3511205-06
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	2
Tank Capacity:	12000
Begin Date:	10/01/2006
End Date:	10/01/2007
Policy Name:	ZURICH INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	USC 3511205-06
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2006
End Date:	10/01/2007
Policy Name:	ZURICH INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	USC 3511205-09
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711

7-ELEVEN 35904 (Continued) **U003436575**

Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	2
Tank Capacity:	12000
Begin Date:	10/01/2009
End Date:	10/01/2010
Policy Name:	ZURICH INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	G23879670 002
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	10/01/2011
End Date:	10/01/2012
Policy Name:	ILLINOIS UNION INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	G23879670 001
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	2
Tank Capacity:	12000
Begin Date:	10/01/2010
End Date:	10/01/2011
Policy Name:	ILLINOIS UNION INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	001235401
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711

7-ELEVEN 35904 (Continued) **U003436575**

Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	1
Tank Capacity:	10000
Begin Date:	12/18/2012
End Date:	12/18/2013
Policy Name:	IRONSHORE SPECIALTY INSURANCE CO
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	001235401
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	2
Tank Capacity:	12000
Begin Date:	12/18/2012
End Date:	12/18/2013
Policy Name:	IRONSHORE SPECIALTY INSURANCE CO
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled
Policy:	G23879670 002
Id #:	2-002536
Owner Name:	7-ELEVEN INC
Owner Address:	ATTN: GASOLINE ACCOUNTING
Owner Address:	PO BOX 711
Owner City:	DALLAS
Owner State:	TX
Owner Zip:	75221
Owner Phone:	972-828-1100
Tank Id #:	2
Tank Capacity:	12000
Begin Date:	10/01/2011
End Date:	10/01/2012
Policy Name:	ILLINOIS UNION INSURANCE COMPANY
Tank Material:	Polyethylene Tank Jacket
Tank Option:	Tank Mod (Sec. Tank Option)
Pipe Material:	Environ
Pipe Option:	Double-Walled

12
North
1/4-1/2
0.329 mi.
1735 ft.

MCJUNKIN CORP
835 HILLCREST DR
CHARLESTON, WV 25311

WV LUST **U003436340**
WV UST **N/A**

Relative:
Higher

Actual:
774 ft.

LUST:

Name:	MCJUNKIN CORP
Address:	835 HILLCREST DR
City,State,Zip:	CHARLESTON, WV 25311
Facility ID:	2002066
Leak Number:	95-142
Confirmed Release Date:	08/29/1995
Cleanup Initiated Date:	08/29/1995
Cleanup Complete Date:	06/28/2010
EDR Link ID:	2-002066

UST:

Name:	MCJUNKIN CORP
Address:	835 HILLCREST DR
City:	CHARLESTON
Facility ID:	2002066
Owner:	MCJUNKIN CORP
Owner Address:	835 HILLCREST DR BOX 513
Owner City,St,Zip:	CHARLESTON, WV 25322
Owner Telephone:	(304) 348-5211
Tank ID:	-1
Tank Status:	**Permanently Out of Service**
Tank Substance:	Diesel
Tank Capacity:	1000
Date Last Used:	08/29/1995
Date Closed:	08/29/1995
Closure Status:	Tank removed from ground
Tank Material:	Asphalt Coated or Bare Steel
Piping Material:	Other
Overfill Installed:	No
Installed Spill Protection:	No
Cathodic Protection Method:	No
Compartment:	1

13
NW
1/4-1/2
0.355 mi.
1872 ft.

DONS DISPOSAL SERVICE INC
CRAIGS BRANCH ROAD
CHARLESTON, WV 25325

SEMS **1000374568**
RCRA NonGen / NLR **WVD041376393**
ECHO

Relative:
Higher

Actual:
603 ft.

SEMS:

Site ID:	0302935
EPA ID:	WVD041376393
Name:	DONS DISPOSAL SERVICE INC
Address:	CRAIGS BRANCH ROAD
City,State,Zip:	CHARLESTON, WV 25325
Cong District:	02
FIPS Code:	54039
FF:	N
NPL:	Not on the NPL
Non NPL Status:	Other Cleanup Activity: State-Lead Cleanup

DONS DISPOSAL SERVICE INC (Continued) **1000374568**

SEMS Detail:

Region:	03
Site ID:	0302935
EPA ID:	WVD041376393
Site Name:	DONS DISPOSAL SERVICE INC
NPL:	N
FF:	N
OU:	00
Action Code:	DS
Action Name:	DISCVRY
SEQ:	1
Start Date:	1979-05-01 04:00:00
Finish Date:	5/1/1979 4:00:00 AM
Current Action Lead:	EPA Perf

Region:	03
Site ID:	0302935
EPA ID:	WVD041376393
Site Name:	DONS DISPOSAL SERVICE INC
NPL:	N
FF:	N
OU:	00
Action Code:	RS
Action Name:	RV ASSESS
SEQ:	1
Start Date:	1998-11-09 05:00:00
Finish Date:	11/19/1999 5:00:00 AM
Current Action Lead:	EPA Perf

Region:	03
Site ID:	0302935
EPA ID:	WVD041376393
Site Name:	DONS DISPOSAL SERVICE INC
NPL:	N
FF:	N
OU:	00
Action Code:	OO
Action Name:	SITE REASS
SEQ:	1
Start Date:	2000-07-05 04:00:00
Finish Date:	5/8/2001 4:00:00 AM
Qual:	L
Current Action Lead:	EPA Perf

Region:	03
Site ID:	0302935
EPA ID:	WVD041376393
Site Name:	DONS DISPOSAL SERVICE INC
NPL:	N
FF:	N
OU:	00
Action Code:	PA
Action Name:	PA
SEQ:	1
Start Date:	2000-07-05 04:00:00
Finish Date:	5/8/2001 4:00:00 AM
Qual:	L

DONS DISPOSAL SERVICE INC (Continued) **1000374568**

Current Action Lead: EPA Perf

Region: 03
Site ID: 0302935
EPA ID: WVD041376393
Site Name: DONS DISPOSAL SERVICE INC
NPL: N
FF: N
OU: 00
Action Code: VA
Action Name: OTHR CLEANUP
SEQ: 1
Start Date: 2012-01-18 05:00:00
Current Action Lead: St Perf

RCRA NonGen / NLR:
Date form received by agency: 1980-09-08 00:00:00.0
Facility name: DONS DISPOSAL SERV INC
Facility address: 525 CAROLINA AVE
CHARLESTON, WV 25301
EPA ID: WVD041376393
Contact: ENVIRONMENTAL COORDINATOR
Contact address: 525 CAROLINA AVE
CHARLESTON, WV 25301
Contact country: US
Contact telephone: 215-555-1212
EPA Region: 03
Classification: Non-Generator
Description: Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:
Owner/operator address: OWNERSTREET
OWNERCITY, AK 99999
Owner/operator country: US
Owner/operator telephone: 215-555-1212
Legal status: Private
Owner/Operator Type: Owner

Owner/operator name: OPERNAME
Owner/operator address: OPERSTREET
OPERCITY, AK 99999
Owner/operator country: US
Owner/operator telephone: 215-555-1212
Legal status: Private
Owner/Operator Type: Operator

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No

DONS DISPOSAL SERVICE INC (Continued) **1000374568**

Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Violation Status: No violations found

ECHO:

Envid:	1000374568
Registry ID:	110070635988
DFR URL:	http://echo.epa.gov/detailed-facility-report?fid=110070635988
Name:	DONS DISPOSAL SERV INC
Address:	525 CAROLINA AVE
City,State,Zip:	CHARLESTON, WV 25301

Count: 4 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
CHARLESTON	1003866301	CHARLESTON TOWN GAS	VA & KANAWHA STS	25301	SEMS-ARCHIVE
CHARLESTON	S118196820		FAIRFIELD INN 1000 WASHINGTON		WV CDL
CHARLESTON	S125321641	PLANET FITNESS	MACCORKLE AVE AND 57TH STREET		WV VCP
CHARLESTON	S108194496	CHARLESTON POLICE DEPARTMENT-DRUG	1599 WASHINGTON & ELIZABETH ST		WV CDL

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
WV	AIRS	Permitted Facility and Emissions Listing	Department of Environmental Protection	02/21/2020	02/21/2020	04/29/2020
WV	ASBESTOS	ASBESTOS	Department of Environmental Protection	07/24/2018	08/16/2018	09/07/2018
WV	AST	Aboveground Storage Tanks	DEP	01/23/2020	01/23/2020	03/31/2020
WV	BROWNFIELDS	Brownfields Sites Listing	Department of Environmental Protection	05/02/2019	05/15/2019	07/16/2019
WV	CDL	Drug Lab Site Locations	Department of Environmental Protection	07/15/2019	07/18/2019	08/02/2019
WV	COAL ASH	Coal Ash Landills	Department of Environmental Protection	10/13/2016	04/19/2017	07/18/2017
WV	DRYCLEANERS	Listing of Drycleaner Locations	Department of Environmental Protection	02/12/2020	02/26/2020	05/06/2020
WV	Financial Assurance	Financial Assurance Information Listing	Department of Environmental Protection	11/27/2017	11/29/2017	12/21/2017
WV	INST CONTROL	Sites with Institutional Controls	Department of Environmental Protection	01/22/2020	02/21/2020	04/29/2020
WV	LAST	Leaking Aboveground Storage Tanks	Department of Environmental Protection	01/22/2020	01/23/2020	04/01/2020
WV	LCP	Landfill Closure Program	Department of Environmental Protection	12/31/2018	06/19/2019	08/02/2019
WV	LUST	Leaking Underground Storage Tanks	Division of Environmental Protection	02/05/2020	02/26/2020	05/06/2020
WV	MINES	MINES	Department of Environmental Protection	02/18/2020	02/20/2020	04/29/2020
WV	NPDES	Wastewater Discharge Permits Listing	Department of Environmental Protection	03/09/2020	03/10/2020	05/20/2020
WV	RGA LF	Recovered Government Archive Solid Waste Facilities List	Division of Environmental Protection		07/01/2013	01/20/2014
WV	RGA LUST	Recovered Government Archive Leaking Underground Storage Tan	Division of Environmental Protection		07/01/2013	12/30/2013
WV	SHWS	This state does not maintain a SHWS list. See the Federal CE	Department of Environmental Protection			
WV	SPILLS	Spills Listing	Office of Emergency Services	02/17/2020	02/18/2020	04/27/2020
WV	SWF/LF	List of M.S.W. Landfills/Transfer Station Listing	Division of Environmental Protection	06/24/2019	06/27/2019	09/10/2019
WV	UIC	Underground Injection Wells	Department of Environmental Protection	03/30/2020	03/30/2020	04/27/2020
WV	UST	Underground Storage Tank Database	Division of Environmental Protection	02/25/2020	02/26/2020	05/06/2020
WV	VCP	Voluntary Remediation Sites	Department of Environmental Protection	01/22/2020	02/21/2020	04/29/2020
US	2020 COR ACTION	2020 Corrective Action Program List	Environmental Protection Agency	09/30/2017	05/08/2018	07/20/2018
US	ABANDONED MINES	Abandoned Mines	Department of Interior	12/09/2019	12/11/2019	02/27/2020
US	BRS	Biennial Reporting System	EPA/NTIS	12/31/2015	02/22/2017	09/28/2017
US	COAL ASH DOE	Steam-Electric Plant Operation Data	Department of Energy	12/31/2018	12/04/2019	01/15/2020
US	COAL ASH EPA	Coal Combustion Residues Surface Impoundments List	Environmental Protection Agency	01/12/2017	03/05/2019	11/11/2019
US	CONSENT	Superfund (CERCLA) Consent Decrees	Department of Justice, Consent Decree Library	12/31/2019	01/17/2020	03/06/2020
US	CORRACTS	Corrective Action Report	EPA	03/23/2020	03/25/2020	05/21/2020
US	DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations	EPA, Region 9	01/12/2009	05/07/2009	09/21/2009
US	DOCKET HWC	Hazardous Waste Compliance Docket Listing	Environmental Protection Agency	05/31/2018	07/26/2018	10/05/2018
US	DOD	Department of Defense Sites	USGS	12/31/2005	11/10/2006	01/11/2007
US	DOT OPS	Incident and Accident Data	Department of Transporation, Office of Pipeli	01/02/2020	01/28/2020	04/17/2020
US	Delisted NPL	National Priority List Deletions	EPA	01/30/2020	02/05/2020	02/14/2020
US	ECHO	Enforcement & Compliance History Information	Environmental Protection Agency	01/05/2020	01/07/2020	03/06/2020
US	EDR Hist Auto	EDR Exclusive Historical Auto Stations	EDR, Inc.			
US	EDR Hist Cleaner	EDR Exclusive Historical Cleaners	EDR, Inc.			
US	EDR MGP	EDR Proprietary Manufactured Gas Plants	EDR, Inc.			
US	EPA WATCH LIST	EPA WATCH LIST	Environmental Protection Agency	08/30/2013	03/21/2014	06/17/2014
US	ERNS	Emergency Response Notification System	National Response Center, United States Coast	12/16/2019	12/19/2019	03/06/2020
US	FEDERAL FACILITY	Federal Facility Site Information listing	Environmental Protection Agency	04/03/2019	04/05/2019	05/14/2019
US	FEDLAND	Federal and Indian Lands	U.S. Geological Survey	04/02/2018	04/11/2018	11/06/2019
US	FEMA UST	Underground Storage Tank Listing	FEMA	08/27/2019	08/28/2019	11/11/2019
US	FINDS	Facility Index System/Facility Registry System	EPA	11/22/2019	12/04/2019	03/02/2020
US	FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA/Office of Prevention, Pesticides and Toxi	04/09/2009	04/16/2009	05/11/2009
US	FTTS INSP	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA	04/09/2009	04/16/2009	05/11/2009
US	FUDS	Formerly Used Defense Sites	U.S. Army Corps of Engineers	01/28/2020	02/19/2020	05/14/2020

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	FUELS PROGRAM	EPA Fuels Program Registered Listing	EPA	02/18/2020	02/19/2020	05/14/2020
US	FUSRAP	Formerly Utilized Sites Remedial Action Program	Department of Energy	08/08/2017	09/11/2018	09/14/2018
US	HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HIST FTTS INSP	FIFRA/TSCA Tracking System Inspection & Enforcement Case Lis	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HMIRS	Hazardous Materials Information Reporting System	U.S. Department of Transportation	12/05/2019	12/06/2019	02/14/2020
US	ICIS	Integrated Compliance Information System	Environmental Protection Agency	11/18/2016	11/23/2016	02/10/2017
US	IHS OPEN DUMPS	Open Dumps on Indian Land	Department of Health & Human Serivces, Indian	04/01/2014	08/06/2014	01/29/2015
US	INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land	EPA Region 1	10/01/2019	12/04/2019	02/10/2020
US	INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land	EPA Region 10	10/11/2019	12/04/2019	02/10/2020
US	INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land	EPA Region 4	10/10/2019	12/05/2019	02/10/2020
US	INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land	EPA, Region 5	10/01/2019	12/04/2019	02/10/2020
US	INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land	EPA Region 6	10/02/2019	12/04/2019	02/10/2020
US	INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land	EPA Region 7	10/15/2019	12/17/2019	02/10/2020
US	INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land	EPA Region 8	10/03/2019	12/04/2019	02/14/2020
US	INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land	Environmental Protection Agency	10/04/2019	12/04/2019	02/27/2020
US	INDIAN ODI	Report on the Status of Open Dumps on Indian Lands	Environmental Protection Agency	12/31/1998	12/03/2007	01/24/2008
US	INDIAN RESERV	Indian Reservations	USGS	12/31/2014	07/14/2015	01/10/2017
US	INDIAN UST R1	Underground Storage Tanks on Indian Land	EPA, Region 1	10/01/2019	12/04/2019	02/10/2020
US	INDIAN UST R10	Underground Storage Tanks on Indian Land	EPA Region 10	10/11/2019	12/04/2019	02/10/2020
US	INDIAN UST R4	Underground Storage Tanks on Indian Land	EPA Region 4	10/10/2019	12/05/2019	02/10/2020
US	INDIAN UST R5	Underground Storage Tanks on Indian Land	EPA Region 5	10/01/2019	12/04/2019	02/10/2020
US	INDIAN UST R6	Underground Storage Tanks on Indian Land	EPA Region 6	10/02/2019	12/04/2019	02/10/2020
US	INDIAN UST R7	Underground Storage Tanks on Indian Land	EPA Region 7	10/11/2019	12/04/2019	02/10/2020
US	INDIAN UST R8	Underground Storage Tanks on Indian Land	EPA Region 8	10/03/2019	12/04/2019	02/14/2020
US	INDIAN UST R9	Underground Storage Tanks on Indian Land	EPA Region 9	10/04/2019	12/04/2019	02/27/2020
US	INDIAN VCP R1	Voluntary Cleanup Priority Listing	EPA, Region 1	07/27/2015	09/29/2015	02/18/2016
US	INDIAN VCP R7	Voluntary Cleanup Priority Lisitng	EPA, Region 7	03/20/2008	04/22/2008	05/19/2008
US	LEAD SMELTER 1	Lead Smelter Sites	Environmental Protection Agency	01/30/2020	02/05/2020	02/14/2020
US	LEAD SMELTER 2	Lead Smelter Sites	American Journal of Public Health	04/05/2001	10/27/2010	12/02/2010
US	LIENS 2	CERCLA Lien Information	Environmental Protection Agency	01/30/2020	02/05/2020	02/14/2020
US	LUCIS	Land Use Control Information System	Department of the Navy	11/04/2019	11/13/2019	01/28/2020
US	MINES MRDS	Mineral Resources Data System	USGS	04/06/2018	10/21/2019	10/24/2019
US	MINES VIOLATIONS	MSHA Violation Assessment Data	DOL, Mine Safety & Health Admi	03/31/2020	04/01/2020	05/21/2020
US	MLTS	Material Licensing Tracking System	Nuclear Regulatory Commission	10/25/2019	10/25/2019	01/15/2020
US	NPL	National Priority List	EPA	01/30/2020	02/05/2020	02/14/2020
US	NPL LIENS	Federal Superfund Liens	EPA	10/15/1991	02/02/1994	03/30/1994
US	ODI	Open Dump Inventory	Environmental Protection Agency	06/30/1985	08/09/2004	09/17/2004
US	PADS	PCB Activity Database System	EPA	10/09/2019	10/11/2019	12/20/2019
US	PCB TRANSFORMER	PCB Transformer Registration Database	Environmental Protection Agency	09/13/2019	11/06/2019	02/10/2020
US	PRP	Potentially Responsible Parties	EPA	01/30/2020	02/06/2020	02/14/2020
US	Proposed NPL	Proposed National Priority List Sites	EPA	01/30/2020	02/05/2020	02/14/2020
US	RAATS	RCRA Administrative Action Tracking System	EPA	04/17/1995	07/03/1995	08/07/1995
US	RADINFO	Radiation Information Database	Environmental Protection Agency	07/01/2019	07/01/2019	09/23/2019
US	RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated	Environmental Protection Agency	03/23/2020	03/25/2020	05/21/2020
US	RCRA-LQG	RCRA - Large Quantity Generators	Environmental Protection Agency	03/23/2020	03/25/2020	05/21/2020
US	RCRA-SQG	RCRA - Small Quantity Generators	Environmental Protection Agency	03/23/2020	03/25/2020	05/21/2020
US	RCRA-TSDF	RCRA - Treatment, Storage and Disposal	Environmental Protection Agency	03/23/2020	03/25/2020	05/21/2020

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	RCRA-VSQG	RCRA - Very Small Quantity Generators (Formerly Conditionall	Environmental Protection Agency	03/23/2020	03/25/2020	05/21/2020
US	RMP	Risk Management Plans	Environmental Protection Agency	11/05/2019	11/20/2019	04/17/2020
US	ROD	Records Of Decision	EPA	01/30/2020	02/05/2020	02/14/2020
US	SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing	Environmental Protection Agency	01/01/2017	02/03/2017	04/07/2017
US	SEMS	Superfund Enterprise Management System	EPA	01/30/2020	02/05/2020	02/14/2020
US	SEMS-ARCHIVE	Superfund Enterprise Management System Archive	EPA	01/30/2020	02/05/2020	02/14/2020
US	SSTS	Section 7 Tracking Systems	EPA	05/01/2019	10/23/2019	01/15/2020
US	TRIS	Toxic Chemical Release Inventory System	EPA	12/31/2018	02/05/2020	04/24/2020
US	TSCA	Toxic Substances Control Act	EPA	12/31/2016	06/21/2017	01/05/2018
US	UMTRA	Uranium Mill Tailings Sites	Department of Energy	08/30/2019	11/15/2019	01/28/2020
US	US AIRS (AFS)	Aerometric Information Retrieval System Facility Subsystem (	EPA	10/12/2016	10/26/2016	02/03/2017
US	US AIRS MINOR	Air Facility System Data	EPA	10/12/2016	10/26/2016	02/03/2017
US	US BROWNFIELDS	A Listing of Brownfields Sites	Environmental Protection Agency	12/02/2019	12/16/2019	03/06/2020
US	US CDL	Clandestine Drug Labs	Drug Enforcement Administration	06/11/2019	06/13/2019	09/03/2019
US	US ENG CONTROLS	Engineering Controls Sites List	Environmental Protection Agency	02/13/2020	02/20/2020	05/15/2020
US	US FIN ASSUR	Financial Assurance Information	Environmental Protection Agency	12/16/2019	12/19/2019	02/27/2020
US	US HIST CDL	National Clandestine Laboratory Register	Drug Enforcement Administration	06/11/2019	06/13/2019	09/03/2019
US	US INST CONTROLS	Institutional Controls Sites List	Environmental Protection Agency	02/13/2020	02/20/2020	05/15/2020
US	US MINES	Mines Master Index File	Department of Labor, Mine Safety and Health A	02/11/2020	02/25/2020	05/21/2020
US	US MINES 2	Ferrous and Nonferrous Metal Mines Database Listing	USGS	01/16/2018	02/28/2020	05/22/2020
US	US MINES 3	Active Mines & Mineral Plants Database Listing	USGS	04/14/2011	06/08/2011	09/13/2011
US	UXO	Unexploded Ordnance Sites	Department of Defense	12/31/2017	01/17/2019	04/01/2019
NJ	NJ MANIFEST	Manifest Information	Department of Environmental Protection	12/31/2018	04/10/2019	05/16/2019
NY	NY MANIFEST	Facility and Manifest Data	Department of Environmental Conservation	01/01/2019	05/01/2019	06/21/2019
PA	PA MANIFEST	Manifest Information	Department of Environmental Protection	06/30/2018	07/19/2019	09/10/2019
RI	RI MANIFEST	Manifest information	Department of Environmental Management	12/31/2018	10/02/2019	12/10/2019
WI	WI MANIFEST	Manifest Information	Department of Natural Resources	05/31/2018	06/19/2019	09/03/2019
US	AHA Hospitals	Sensitive Receptor: AHA Hospitals	American Hospital Association, Inc.			
US	Medical Centers	Sensitive Receptor: Medical Centers	Centers for Medicare & Medicaid Services			
US	Nursing Homes	Sensitive Receptor: Nursing Homes	National Institutes of Health			
US	Public Schools	Sensitive Receptor: Public Schools	National Center for Education Statistics			
US	Private Schools	Sensitive Receptor: Private Schools	National Center for Education Statistics			
WV	Daycare Centers	Sensitive Receptor: Day Care Center List	Office of Social Services			
US	Flood Zones	100-year and 500-year flood zones	Emergency Management Agency (FEMA)			
US	NWI	National Wetlands Inventory	U.S. Fish and Wildlife Service			
WV	State Wetlands	Wetland Inventory	US Fish & Wildlife Service			
US	Topographic Map	Current USGS 7.5 Minute Topographic Map	U.S. Geological Survey			
US	Oil/Gas Pipelines		Endeavor Business Media			
US	Electric Power Transmission Line Data		Endeavor Business Media			

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

N2207015
302 JEFFERSON STREET
CHARLESTON, WV 25311

TARGET PROPERTY COORDINATES

Latitude (North):	38.337069 - 38° 20' 13.45''
Longitude (West):	81.608436 - 81° 36' 30.37''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	446824.8
UTM Y (Meters):	4243183.5
Elevation:	599 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	6010614 CHARLESTON EAST, WV
Version Date:	2014
West Map:	6014363 CHARLESTON WEST, WV
Version Date:	2014

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

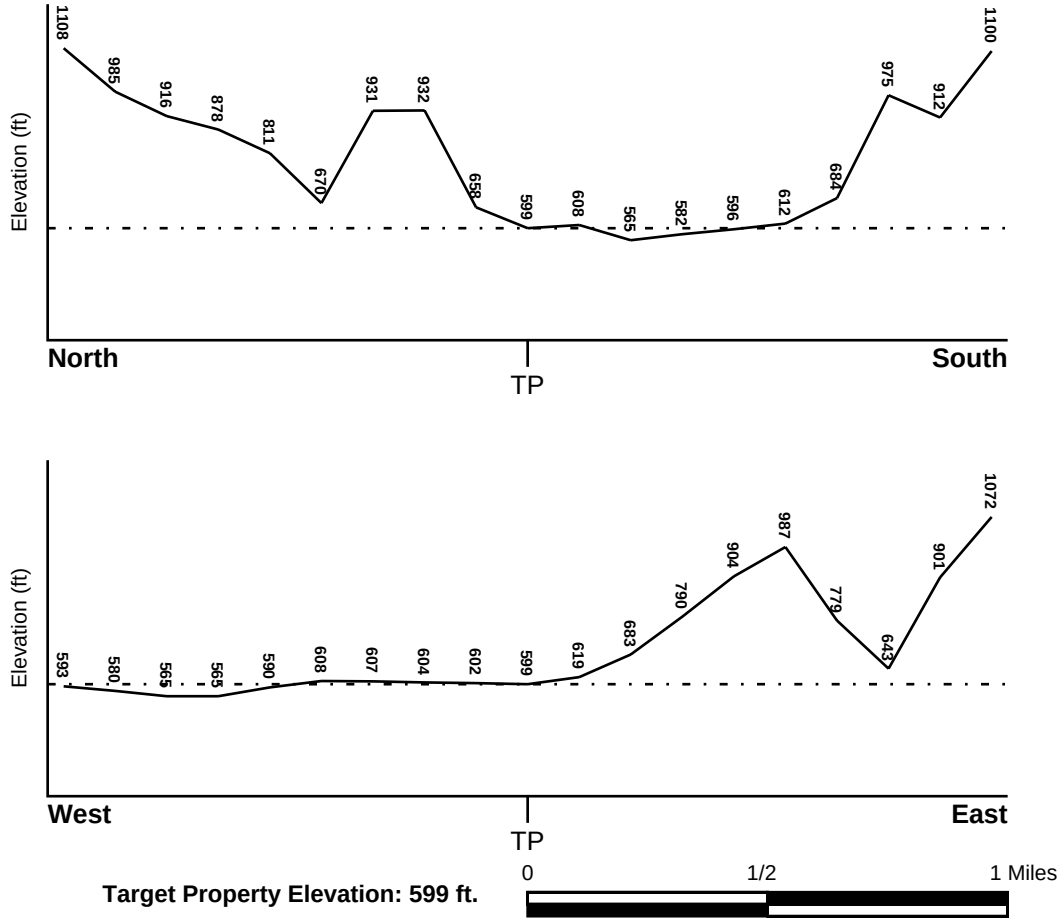
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General SSW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Flood Plain Panel at Target Property	FEMA Source Type
54039C0428E	FEMA FIRM Flood data

Additional Panels in search area:	FEMA Source Type
54039C0427E	FEMA FIRM Flood data
54039C0426E	FEMA FIRM Flood data
54039C0429E	FEMA FIRM Flood data
54039C0409E	FEMA FIRM Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
CHARLESTON EAST	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

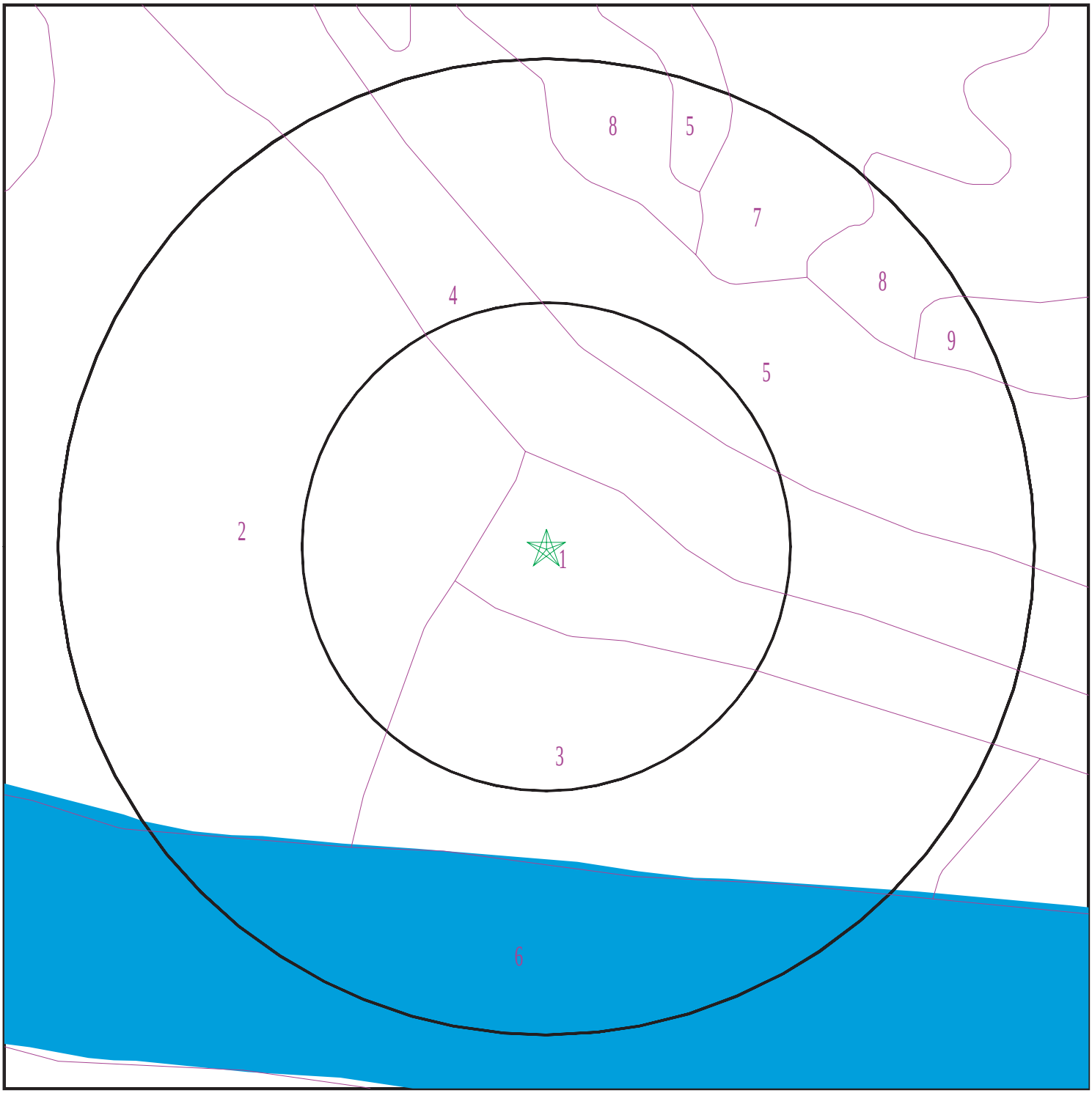
Era:	Paleozoic
System:	Pennsylvanian
Series:	Des Moinesian Series
Code:	PP2 *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 6073152.2s



Target Property
SSURGO Soil
Water

0 1/16 1/8 1/4 Miles

N

SITE NAME:	N2207015	CLIENT:	Terracon
ADDRESS:	302 Jefferson Street Charleston WV 25311	CONTACT:	Levi Sheff
		INQUIRY #:	6073152.2s
LAT/LONG:	38.337069 / 81.608436	DATE:	May 26, 2020 9:59 am

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GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Urban land

Soil Surface Texture:
Hydrologic Group: Not reported

Soil Drainage Class:
Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 2

Soil Component Name: Urban land

Soil Surface Texture:
Hydrologic Group: Not reported

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 3

Soil Component Name: Urban land

Soil Surface Texture: bedrock

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class:

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	5 inches	bedrock	Not reported	Not reported	Max: Min:	Max: Min:

Soil Map ID: 4

Soil Component Name: Udorthents, smoothed

Soil Surface Texture: bedrock

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 5

Soil Component Name: Clymer

Soil Surface Texture: channery loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 76 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	11 inches	channery loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
2	11 inches	37 inches	channery clay loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
3	37 inches	51 inches	very channery loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
4	51 inches	55 inches	weathered bedrock	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:

Soil Map ID: 6

Soil Component Name: Water

Soil Surface Texture: channery loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 7

Soil Component Name: Gilpin

Soil Surface Texture: silt loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	11 inches	silt loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
2	11 inches	29 inches	channery silty clay loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
3	29 inches	35 inches	very channery silt loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
4	35 inches	38 inches	unweathered bedrock	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:

Soil Map ID: 8

Soil Component Name: Gilpin

Soil Surface Texture: silt loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	11 inches	silt loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
2	11 inches	29 inches	channery silty clay loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
3	29 inches	35 inches	very channery silt loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
4	35 inches	38 inches	unweathered bedrock	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:

Soil Map ID: 9

Soil Component Name: Gilpin

Soil Surface Texture: silt loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	11 inches	silt loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
2	11 inches	29 inches	channery silty clay loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
3	29 inches	35 inches	very channery silt loam	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:
4	35 inches	38 inches	unweathered bedrock	Not reported	Not reported	Max: 4 Min: 1.4	Max: Min:

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	USGS40001296644	1/8 - 1/4 Mile West
2	USGS40001296604	1/2 - 1 Mile SSE
3	USGS40001296622	1/2 - 1 Mile ESE
A4	USGS40001296598	1/2 - 1 Mile SSE
A5	USGS40001296597	1/2 - 1 Mile SSE
B6	USGS40001296711	1/2 - 1 Mile NW
B7	USGS40001296715	1/2 - 1 Mile NW
8	USGS40001296647	1/2 - 1 Mile West
C9	USGS40001296608	1/2 - 1 Mile SE
C10	USGS40001296603	1/2 - 1 Mile SE
D11	USGS40001296699	1/2 - 1 Mile NW
D12	USGS40001296700	1/2 - 1 Mile NW
C13	USGS40001296607	1/2 - 1 Mile SE
14	USGS40001296735	1/2 - 1 Mile NNE
E15	USGS40001296595	1/2 - 1 Mile SE
E16	USGS40001296596	1/2 - 1 Mile SE

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

OTHER STATE DATABASE INFORMATION

STATE OIL/GAS WELL INFORMATION

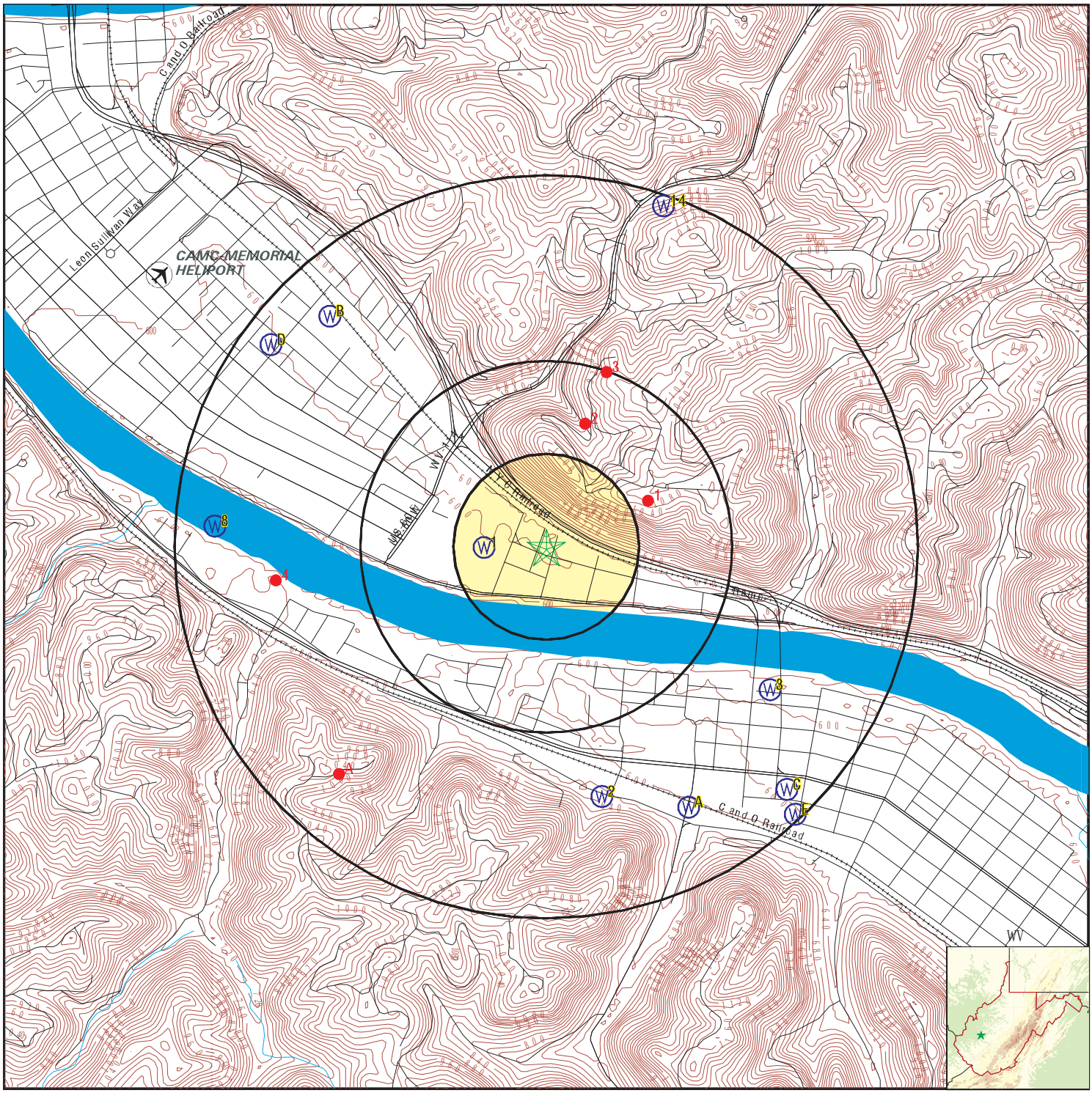
MAP ID	WELL ID	LOCATION FROM TP
1	WVOG12000058517	1/4 - 1/2 Mile ENE

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
2	WVOG12000058692	1/4 - 1/2 Mile NNE
3	WVOG12000067750	1/4 - 1/2 Mile NNE
4	WVOG12000061223	1/2 - 1 Mile West
A6	WVOG12000059441	1/2 - 1 Mile SW
A5	WVOG12000057470	1/2 - 1 Mile SW

PHYSICAL SETTING SOURCE MAP - 6073152.2s



- County Boundary
- Major Roads
- Contour Lines
- Airports
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- Indeterminate Groundwater Flow at Location
- Groundwater Flow Varies at Location
- Oil, gas or related wells

SITE NAME:	N2207015	CLIENT:	Terracon
ADDRESS:	302 Jefferson Street Charleston WV 25311	CONTACT:	Levi Sheff
		INQUIRY #:	6073152.2s
LAT/LONG:	38.337069 / 81.608436	DATE:	May 26, 2020 9:59 am

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

1
West
1/8 - 1/4 Mile
Higher

FED USGS **USGS40001296644**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0865	Type:	Well
Description:	Orig staname was RS026 OFFICE OF EMERG SERV		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Kanawha Formation	Aquifer Type:	Not Reported
Construction Date:	19790301	Well Depth:	98
Well Depth Units:	ft	Well Hole Depth:	98
Well Hole Depth Units:	ft		

2
SSE
1/2 - 1 Mile
Higher

FED USGS **USGS40001296604**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0232	Type:	Well
Description:	Original station name was 4009019		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Not Reported
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19100101	Well Depth:	Not Reported
Well Depth Units:	Not Reported	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

3
ESE
1/2 - 1 Mile
Lower

FED USGS **USGS40001296622**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0235	Type:	Well
Description:	Original station name was 4009027		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Not Reported
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19570101	Well Depth:	53
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

Ground water levels,Number of Measurements:	1	Level reading date:	1957-05-01
Feet below surface:	29.00	Feet to sea level:	Not Reported
Note:	Not Reported		

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

A4
SSE **FED USGS** **USGS40001296598**
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0229	Type:	Well
Description:	Original station name was 4009020		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Not Reported
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19220101	Well Depth:	74
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

A5
SSE **FED USGS** **USGS40001296597**
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0228	Type:	Well
Description:	Original station name was 4009021		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Not Reported
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19220101	Well Depth:	80
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

B6
NW **FED USGS** **USGS40001296711**
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0256	Type:	Well
Description:	Original station name was 4005042		
HUC:	05050007	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Alluvial aquifers
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19570101	Well Depth:	53
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

Ground water levels,Number of Measurements:	1	Level reading date:	1957-05-01
Feet below surface:	4.00	Feet to sea level:	Not Reported
Note:	Not Reported		

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

B7
NW
1/2 - 1 Mile
Higher

FED USGS **USGS40001296715**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0656	Type:	Well
Description:	Original station name was 5 41NY CENTRAL RR		
HUC:	05050007	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Alluvial aquifers
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19570101	Well Depth:	52
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

Ground water levels,Number of Measurements:	1	Level reading date:	1957-05-01
Feet below surface:	4.00	Feet to sea level:	Not Reported
Note:	Not Reported		

8
West
1/2 - 1 Mile
Lower

FED USGS **USGS40001296647**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0240	Type:	Well
Description:	Original station name was 4009018		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Not Reported
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19250101	Well Depth:	27
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

Ground water levels,Number of Measurements:	1	Level reading date:	1957-01-01
Feet below surface:	14.00	Feet to sea level:	Not Reported
Note:	Not Reported		

C9
SE
1/2 - 1 Mile
Higher

FED USGS **USGS40001296608**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0234	Type:	Well
Description:	Orig staname was 40-9-25 CONLON BAKING CO		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Kanawha Formation	Aquifer Type:	Not Reported
Construction Date:	19460101	Well Depth:	100

Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

C10
SE **FED USGS** **USGS40001296603**
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0231	Type:	Well
Description:	Orig staname was 40-9-26 CONLON BAKING CO		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Kanawha Formation	Aquifer Type:	Not Reported
Construction Date:	19400101	Well Depth:	90
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

D11
NW **FED USGS** **USGS40001296699**
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0650	Type:	Well
Description:	Original staname was 4 41KANAWHA C BD ED		
HUC:	05050007	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19320101	Well Depth:	145
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

Ground water levels,Number of Measurements:	1	Level reading date:	1957-07-01
Feet below surface:	32.00	Feet to sea level:	Not Reported
Note:	Not Reported		

D12
NW **FED USGS** **USGS40001296700**
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0251	Type:	Well
Description:	Original station name was 4005041		
HUC:	05050007	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19320101	Well Depth:	145
Well Depth Units:	ft	Well Hole Depth:	Not Reported

Well Hole Depth Units: Not Reported

C13
SE
1/2 - 1 Mile
Higher

FED USGS **USGS40001296607**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0233	Type:	Well
Description:	Orig staname was 40-9-24 CONLON BAKING CO		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Kanawha Formation	Aquifer Type:	Not Reported
Construction Date:	19380101	Well Depth:	225
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

14
NNE
1/2 - 1 Mile
Higher

FED USGS **USGS40001296735**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0662	Type:	Well
Description:	Original station name was 6 41A D DEITRICK		
HUC:	05050007	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Pennsylvanian aquifers
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19300101	Well Depth:	70
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

Ground water levels,Number of Measurements:	1	Level reading date:	1957-03-01
Feet below surface:	11.00	Feet to sea level:	Not Reported
Note:	Not Reported		

E15
SE
1/2 - 1 Mile
Higher

FED USGS **USGS40001296595**

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0226	Type:	Well
Description:	Original station name was 4009022		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Not Reported
Formation Type:	Not Reported	Aquifer Type:	Not Reported
Construction Date:	19400101	Well Depth:	226
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance
Elevation

Database	EDR ID Number
FED USGS	**USGS40001296596**

E16
SE
1/2 - 1 Mile
Higher

Organization ID:	USGS-WV		
Organization Name:	USGS West Virginia Water Science Center		
Monitor Location:	Kan-0227	Type:	Well
Description:	Original staname was 40-9-23 CONLON BAKERY		
HUC:	05050006	Drainage Area:	Not Reported
Drainage Area Units:	Not Reported	Contrib Drainage Area:	Not Reported
Contrib Drainage Area Unts:	Not Reported	Aquifer:	Alluvial aquifers
Formation Type:	Holocene Alluvium	Aquifer Type:	Not Reported
Construction Date:	19400101	Well Depth:	58
Well Depth Units:	ft	Well Hole Depth:	Not Reported
Well Hole Depth Units:	Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

1
ENE
1/4 - 1/2 Mile

OIL_GAS **WVOG12000058517**

Permit #:	03502	Well Type:	Vertical
Well Use:	Unknown	Well Depth:	Not Available
Well Rig:	Not Available	Permit Type:	Vertical Well
Issue Date:	Not Reported	Completion Date:	01-JAN-00
Well Status:	Never Drilled	Farm Name:	1
Well #:	1		
Web Map:	http://tagis.dep.wv.gov/imap/imap.php?x=447267.96&y=4243587.02&datum=83&level=17&pntlabel=None		

2
NNE
1/4 - 1/2 Mile

OIL_GAS **WVOG12000058692**

Permit #:	02771	Well Type:	Vertical
Well Use:	Unknown	Well Depth:	Not Available
Well Rig:	Not Available	Permit Type:	Vertical Well
Issue Date:	02-SEP-77	Completion Date:	Not Reported
Well Status:	Abandoned Well	Farm Name:	1
Well #:	1		
Web Map:	http://tagis.dep.wv.gov/imap/imap.php?x=446997.9&y=4243922.3&datum=83&level=17&pntlabel=None		

3
NNE
1/4 - 1/2 Mile

OIL_GAS **WVOG12000067750**

Permit #:	03455	Well Type:	Vertical
Well Use:	Not Available	Well Depth:	Deep
Well Rig:	Not Available	Permit Type:	Other Well
Issue Date:	11-JUL-79	Completion Date:	Not Reported
Well Status:	Abandoned Well	Farm Name:	2
Well #:	2		
Web Map:	http://tagis.dep.wv.gov/imap/imap.php?x=447092.0&y=4244145.3&datum=83&level=17&pntlabel=None		

4
West
1/2 - 1 Mile

OIL_GAS **WVOG12000061223**

Permit #:	05644	Well Type:	Vertical
Well Use:	Unknown	Well Depth:	Shallow greater than 3,000 feet
Well Rig:	Rotary Rig	Permit Type:	Vertical Well
Issue Date:	15-DEC-03	Completion Date:	26-MAR-04
Well Status:	Active Well	Farm Name:	825370
Well #:	825370		
Web Map:	http://tagis.dep.wv.gov/imap/imap.php?x=445654.2&y=4243252.8&datum=83&level=17&pntlabel=None		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

A6
SW
1/2 - 1 Mile

OIL_GAS **WVOG12000059441**

Permit #:	03554	Well Type:	Vertical
Well Use:	Not Available	Well Depth:	Not Available
Well Rig:	Not Available	Permit Type:	Plugging
Issue Date:	06-OCT-81	Completion Date:	Not Reported
Well Status:	Plugged	Farm Name:	N. TEER 20661
Well #:	N. TEER 20661		
Web Map:	http://tagis.dep.wv.gov/imap/imap.php?x=445922.1&y=4242412.3&datum=83&level=17&pntlabel=None		

A5
SW
1/2 - 1 Mile

OIL_GAS **WVOG12000057470**

Permit #:	03554	Well Type:	Vertical
Well Use:	Not Available	Well Depth:	Not Available
Well Rig:	Not Available	Permit Type:	Other Well
Issue Date:	27-AUG-81	Completion Date:	Not Reported
Well Status:	Plugged	Farm Name:	N. TEER 20661
Well #:	N. TEER 20661		
Web Map:	http://tagis.dep.wv.gov/imap/imap.php?x=445922.1&y=4242412.3&datum=83&level=17&pntlabel=None		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

EPA Region 3 Statistical Summary Readings for Zip Code: 25311

Number of sites tested: 66.

Maximum Radon Level: 9.5 pCi/L.
Minimum Radon Level: 0.3 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
51 (77.27%)	15 (22.73%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

Federal EPA Radon Zone for KANAWHA County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

HYDROLOGIC INFORMATION

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Inventory
Source: US Fish & Wildlife Service
Telephone: 703-358-2171

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

West Virginia Water Well Information
Source: Bureau of Public Health
Telephone: 304-558-6765
Community, non-community, non-transient non-community, non-public wells.

OTHER STATE DATABASE INFORMATION

West Virginia Oil and Gas Well Database
Source: Department of Environmental Protection
Telephone: 304-926-0450
Oil and Gas well locations in the state.

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

EPA Region 3 Statistical Summary Readings
Source: Region 3 EPA
Telephone: 215-814-2082
Radon readings for Delaware, D.C., Maryland, Pennsylvania, Virginia and West Virginia.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION

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APPENDIX E

CREDENTIALS

Levi J. Sheff, AEP, CNRP, PRA

SR. STAFF SCIENTIST

PROFESSIONAL NARRATIVE

By holistically evaluating biotic/abiotic variables and their interactions, Mr. Sheff's approach to scientific research is recognized for effectively characterizing ecosystem influencers/implications and amending adverse conditions on an array of private, commercial and protected lands. Throughout his career, he has provided scientific data for various curricula (e.g. State petroleum tank reimbursement programs, Brownfields sites, National Environmental Policy Act [NEPA], etc.) and to County, State and Federal agencies, civil works departments, commercial entities and local-internationally established organizations.

Supplementary to scientific research, Mr. Sheff develops businesses ranging from startup to store fronts for Fortune 500 enterprises, presiding over complete business operations & developing self-sustaining teams ranging from 5-100 personnel locally-internationally. Peripherally, Mr. Sheff historically designed & directed website & mobile application publications.

Recently, Mr. Sheff assisted in the early development of Terracon's Environmental Branch in West Fargo, North Dakota, initiated the Environmental Branch in Bismarck, North Dakota, and is currently directing the growth of Environmental and Natural Resource services in Charleston, West Virginia. He successfully meets objectives by steadily building community rapport, mentoring personnel and providing/designing/managing proposals and projects. Regular services include due-diligence property assessments (Phase I and II Environmental Site Assessments [ESAs] and succeeding assessments through corrective action/reclamation/restoration); NEPA and Environmental Assessments (EAs); aquatic resource delineations (including OHWM) and trending health condition assessments using chemical and biological indicators (e.g. laboratory testing, macro-invertebrates, plant communities, etc.); regulated materials surveys (e.g. asbestos); accustomed research (e.g. threatened, endangered and invasive species [habitat surveys]) and unaccustomed research (e.g. new in-situ brine remediation methods in the Bakken Formation). Moreover, Mr. Sheff assists geotechnical engineering projects (push-probe/hollow-stem augur boring advancements, temporary/permeant groundwater well installations, laboratory analysis [moisture, P200, atterbergs], etc.), serves on local social committee boards, supports the development/implementation of strategic company initiatives, and composes health & safety plans (HASPs) to lead an Incident & Injury-Free (IIF) workplace culture.

PROJECT EXPERIENCE

DUE DILIGENCE

Phase I Environmental Site Assessments: MN, ND, SD, KY, OH, WV, VA

Project manage and perform ESAs on a range of small-large business and property types (agricultural, petroleum, industrial, automotive, retail, healthcare, restaurants, transportation, telecommunications, etc.) for an array of curricula (State tank reimbursement programs, voluntary cleanup sites, Brownfields, etc.). The objective is to identify potential risks of hazardous substance impacts through an all-appropriate inquiry (AAI), which is performed by systematically performing site reconnaissance's, documenting site features and improvements (wells, septic, storage tanks, etc.), interviewing personnel, performing historical research (topographic/aerial imagery, city directories, Sanborn maps, title documents, assessor/equalization documents, etc.), reviewing regulatory reports (City, County, State, Federal), identifying recognized environmental conditions (RECs), and producing final reports with recommendations,

EDUCATION

Bachelor of Arts, Environmental Studies, Human Influence & Sustainability - Concordia College, Moorhead, MN 2011

CERTIFICATIONS (CURRENT)

National Registry of Environmental Professionals -
Associate Environmental Professional (AEP)
Certified Natural Resource Professional (CNRP)

Petroleum Release Assessor (PRA) -
South Dakota Board of Technical Professionals

Wetland Delineator (USACE 87' Supplemental) -
Minnesota Wetland Delineator Certification Program

Unmanned Aircraft Remote Pilot (UAS) -
Department of Transportation Federal Aviation Administration (DOT-FAA)

Asbestos Inspector -
MN, ND, SD, WV and BNSF (E-Rail Contractor)

TransCanada - Contractor and Excavator

OSHA 40-Hour Hazardous Waste Operation (HAZWOPER)

OSHA 10-Hour Construction Safety and Health

H2S Awareness

First Aid, CPR, & AED Trained

RELATED EMPLOYMENT HISTORY

Terracon Consultants Inc. (Scientists & Engineers) -
Environmental Staff Scientist 2014-2016
Sr. Staff Scientist, 2016-Present

City of Greensboro, North Carolina -
Laboratory Scientist, 2013
Surface Water Treatment Operator, 2013-2014

North Dakota State University (Partnership with EPA) -
Wetland Research Scientist, 2011

United States Army Corps of Engineers (USACE) -
Biological Technician Specialist (Interdisciplinary), 2010

AFFILIATIONS

National Registry of Environmental Professionals

South Dakota Association of Environmental Professionals

National Water Quality Monitoring Council

Association of State Wetland Managers

North Dakota Water Quality Monitoring Council

North Carolina Waterworks Operators Association

Minnesota Wetland Professionals Association

River Keepers – Red River of the North

Chamber of Commerce –
Fargo/Moorhead/Bismarck/Charleston

Local Safety Coordinator – Terracon - Bismarck, ND

* *Work performed prior to Terracon*

according to American Society for Testing and Materials (ASTM) E1527-13, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. Mr. Sheff is recognized as an ASTM E1527-13 Environmental Professional (EP).

Phase II Environmental Site Assessments: MN, ND, SD, KY, OH, WV, VA
Design and oversee site investigations on a range of properties including State tank reimbursement programs, voluntary cleanup sites, Brownfields, etc. Compose HASPs and technical final site assessment reports for delineating vertical and horizontal site impacts (agricultural, petroleum, etc.). Field activities include conducting soil, groundwater, and vapor intrusion investigations using push-probe, hollow-stem auger, and/or hand-augur drilling equipment to collect initial or routine samples for laboratory analysis, installing sub-slap Vapor Pin® kits, and real-time monitoring with handheld field equipment (GPS, multiparameter sondes [temperature, dissolved oxygen, pH, PID, etc.).

Asbestos, Radon, Lead Paint, and Hazardous Materials Surveys: MN, ND, SD, WV
Conduct surveys in facilities including healthcare, commercial, residential, and telecommunications to identify and collect/submit samples of suspect asbestos-containing materials (ACMs) for confirmation laboratory analysis. Comparable surveys are conducted for radon and lead-based paint in facilities located in ND.

Geotechnical Investigations: MN, ND, SD
Assists with advancing and patching (when necessary) soil borings using a variety of drilling methods and equipment. Soil profiles are characterized during geotechnical soil investigations, which have ranged down to 80+ feet below grade surface (bgs). Experience has ranged from soil boring to installing temporary and permanent groundwater wells, to performing various Geotechnical soil tests in the laboratory.

NATURAL RESOURCES

Environmental Assessments: SD
EAs are concise public documents prepared under the NEPA to provide sufficient evidence of potential environmental impacts from a proposed federal action or action federally supported. The evaluation determines whether a proposed action would require preparation of an environmental impact statement (EIS), a finding of no significant impact (FONSI) or considering alternative actions to minimize potential impacts while ensuring the purpose/needs are fully satisfied. Experience includes a range of developing greenfield/rural to commercial expansion sites.

Wetland Research Scientist - North Dakota State University (NDSU)*
Research was conducted through NDSU for the Environmental Protection Agency (EPA), contributing to the initial stages of the ongoing 5-year National Wetland Health Condition Assessment (NWCA – year 2011). Mr. Sheff was part of the team of specialists selected for refining the progression/evolution of the plant community research standards which would then pilot the ongoing monitoring program throughout the Prairie Pothole Region. Research involved wetland delineations and health condition assessments including evaluations of their chemical, physical, and biological integrities while considering ecosystem influencers. Site set-up made use of GPS and ArcView Global Information System (GIS) software. Vegetation species, prominence, and densities were evaluated by quadrant surveying on upland, wet meadow and shallow marsh communities. Hydrology and soils were evaluated using wetland stress indicators and the results from submitted laboratory samples. Additional responsibilities entailed researching projects for graduate students and the assembly of taxidermy entries of terrestrial forb species into NDSU's Herbarium database.

Biological Specialist - USACE*
Vertical profiles were created using data obtained by routinely monitoring reservoirs located in the Red River Basin of the North with multi-parameter YSI/Hydrolab sonde and GPS/GIS equipment. The equipment was used to record limnological parameters per meter, for system stratification analysis; further evaluations utilized data of collected water samples submitted for laboratory analysis. Trends were evaluated and described in technical water quality reports. Additional projects included lake vegetation surveys and conducting other various chemical, biological, and ecological research on local region lakes and terrestrial USACE-jurisdiction properties.

Aquatic Resource and OHWM Delineations: MN, ND, WV
Conduct up to Level 3 assessments for potential aquatic resources (e.g. wetlands, tributaries, etc.) by evaluating hydrological, vegetative, and soil hydrology indicators on an array of environmental/topographic settings in the Midwest and Great Plains regions. The existence and physical limits of the aquatic resources are determined. Additionally, these assessments include analysis for connections to jurisdictional waters or interstate commerce, assistance on scope and effect and permitting services, and composing final aquatic resource delineation reports for regulatory concurrence.

Laboratory Scientist and C Certified Surface Water Treatment Operator – City of Greensboro, North Carolina*
Exercised independent judgment for routine and non-routine operation of modern 30 million gallons daily (MGD) and 24 MGD surface water treatment facilities to extract constituents and produce/distribute potable drinking water. Performed quality control tests, measured and adjusted chemical feed rates, operated and monitored electric and diesel pumps (1000 to 2500 HP), operated filtration units, monitored consumer utilization, and adjusted distribution system controls accordingly. Oversaw chemical transfers and inventory by semi-rig, maintained chemical inventories, generated plant operation and consumer reports and performed minor mechanical work and routine equipment maintenance. Laboratory activities included coliform and E-Coli testing, preparing bacteria media, accession, pH, fluoride, phosphate, heterotrophic plate counts, and a range of other typical parameters for municipal water treatment. Additionally, operated and maintained a variety of lab equipment including the stereoscopic microscope, sterilizers, stills, autoclaves and incubators, and more.

Water Quality Monitoring: ND
Monitored drain discharge impacts to the Oakes Aquifer from three closed basins. The monitoring assessment included analysis of constituents and trends on groundwater samples collected from monitoring wells and routine bi-weekly sampling events from the James River and nearby ditches along the discharge route. Water quality data was evaluated and compared to aquatic life standards and assessed in technical reports submitted to the North Dakota Department of Health (NDDH)/ND Department of Environmental Quality (NDDEQ). Other assessments include ongoing performance of Phase II ESAs to monitor groundwater for a range of constituents on an array of property types. Tasks include real-time monitoring with handheld field equipment (GPS, multiparameter sondes [temperature, dissolved oxygen, pH, etc.], photoionization detector [PID], etc.) and documenting relative observable data (emanating odors, indications of nuisances, well riser and screen structural integrity, etc.).

Critical Habitat Surveys: ND
Surveyed natural and disturbed/problematic/atypical prairie plant communities to determine the existence of habitat suitable to support a recovering population of the Dakota Skipper butterfly (*Hesperia dacotae*), declared as a Threatened species in 2014 under the Endangered Species Act. The assessments incorporated desktop and field assessments (Daubenmire Cover Class Method), delineation of suitable habitat if identified, collaboration with the United States Fish and Wildlife Service (USFWS) and composing final reports. The USFWS used the research aid for ongoing monitoring of the Dakota Skipper.

Macroinvertebrate Research: MN, ND*
Evaluated and determined the biological integrity of rivers and tributaries by comparing results of the assessed macro-invertebrate communities to the Biotic Index (indicator scale). Additional research included fundamentals on bank erosion, discharge rate, vegetative species identification, geomorphology, and identifying potential health influencers (point and non-point sources) within the ecosystem. Conclusions from the research was presented at exhibitions in the local Fargo-Moorhead community.

Wood Duck Migration Research: MN*
Researched Wood Duck migration patterns by evaluating monitored Wood Duck Box nests in the Rydell National Wildlife Refuge (RNWR), an approximately 2,120-acre National Wildlife Refuge (NWR). A summary of the research included documentation of freshly assembled Wood Duck nests and observations of evidence indicating the habitual nature of Wood Duck nesting in both new and historically-established nests. The RNWR compiled collected data from historical research to monitor Wood Duck nesting patterns.

REMEDIATION – RECLAMATION – CORRECTIVE ACTION

North Dakota Industrial Commission (NDIC) - Environmental and Spill Response/Reclamation
Oversaw implementation of corrective action plans to remediate and reclaim legacy sites damaged by exploration and production activities and unclaimed hydrocarbon and brine releases associated with former well pads, pits, and seismic boreholes under the Abandoned Oil and Gas Well Plugging and Site Reclamation Fund (AWPSRF). Oversight incorporates vertical and horizontal delineations of impacts, field testing established parameters during the remediation, and reclamation implementation. Closing tasks include assessing, evaluating/interpreting findings, and producing corrective action reports. Additional services include research to assist in development of new in-situ remediation methods.

Agronomy Facilities: MN, ND
Oversaw implementation of corrective action plans to remediate and reclaim legacy sites impacted by exploration and production activities and unclaimed hydrocarbon and brine releases associated with former well pads, pits, and seismic boreholes under the Abandoned Oil and Gas Well Plugging and Site Reclamation Fund (AWPSRF). Oversight incorporates background vegetation species research (for reclamation/seeding), vertical and horizontal delineations of impacts, continuous field testing and directing cleanup during the remediation, and reclamation implementation. Closing tasks include assessing, evaluating/interpreting findings, and producing corrective action reports. Additional services include research to assist in the development of new economical and effective in-situ remediation methods for the industry (e.g. including the incorporation of wetlands for natural attenuation).

Underground Storage Tank Removal: ND, SD, WV
Oversee underground storage tank (UST) removal activities are according to the scope of work, HASPs, and State approved standards. Field activities include monitoring with a PID, collecting soil and groundwater samples for laboratory analysis and documenting site characteristics and activities. Prepared technical reports to document project activities and UST basin conditions to submit to the appropriate governing agency for review.

PUBLICATIONS – PRESENTATIONS – HONORABLE MENTION

Ellingson, J.B., Schonteich, L.H, Gordan, S.M., **Sheff, L.J.**, and J.M., Finck, 2019, **Brine Pond Remediation Techniques – NDIC Oil & Gas Division Research**: 7th Annual North Dakota Reclamation Conference, Reflecting on Reclamation, NDSU Extension Service & Dickinson State University, Dickinson, North Dakota.

Ellingson, J.B., Schonteich, L.H, Gordan, S.M., **Sheff, L.J.**, and J.M., Finck, 2019, **Remediation of Brine Impacted Soils due to Oil and Gas Production**: 31st Annual Environmental & Ground Water Quality Conference, South Dakota Department of Environmental & Natural Resources, Pierre, South Dakota.

Lindeman, C.D., Ellingson, J.B., Schonteich, L.H, and **Sheff, L.J.**, 2018, **Brine Pit Remediation Study – Reducing to Eliminating Waste through In-Situ Remediation**, North Dakota Solid Waste & Recycling Association Fall Conference 2018, North Dakota Solid Waste & Recycling Association, Dickinson, North Dakota.

Finck, J.M., Schonteich, L.H, **Sheff, L.J.** and Ellingson, J.B. 2018, **Remediation and Reclamation of a Legacy Well Pad Impacted by Brine and Petroleum Hydrocarbons**: 30th Annual Environmental & Ground Water Quality Conference, South Dakota Department of Environmental & Natural Resources, Pierre, South Dakota.

River Keepers Annual Water Quality Festival: Fargo, ND – Intermittently Since 2007
Mr. Sheff volunteers to educate 4th graders on the water quality (chemical and biological, including invasive species identification) of the local Red River of the North. Education included demonstrations, presentations, hands on games, collaboration with the community, etc.

Consulting, Environmental and Natural Resource Education, ND – Since 2014
Mr. Sheff educates various facets of the local community on the science sector of the consulting industry. Opportunities have included alumni panel discussions, guest speaking at local universities, and presenting at State-coordinated events.

Water Quality Analysis: Hawley, MN
Sampled, preserved, processed (including spectrometer calibrations and use), and reported water contaminant data for the MN department of natural resources (MNDNR) on local rivers (chemical and biological [duckweeds and other invasive species if identified]).

Local Hydrological Awareness - Bottled Water Campaign: Moorhead, MN*
Initiated and lead a hydrological awareness study for the local community. The study gathered municipal water consumer data from governmental agencies and public service departments to compare to top rated/popular bottled water brands in America using local and national drinking water standards. The purpose of this study was to identify and educate the public regarding the health risks, environmental implications, and purity standards in relation to the economics associated with our water resources. I collaborated with governmental agencies and businesses and presented findings at Concordia College.

APPENDIX F

DESCRIPTION OF TERMS AND ACRONYMS

Description of Selected General Terms and Acronyms

Term/Acronym	*Description*
ACM	Asbestos-Containing Material. Asbestos is a naturally occurring mineral, three varieties of which (chrysotile, amosite, crocidolite) have been commonly used as fireproofing or binding agents in construction materials. Exposure to asbestos, as well as ACM, has been documented to cause lung diseases including asbestosis (scarring of the lung), lung cancer and mesothelioma (a cancer of the lung lining). Regulatory agencies have generally defined ACM as a material containing greater that one (1) percent asbestos, however some states (e.g. California) define ACM as materials having 0.1% asbestos. In order to define a homogenous material as non-ACM, a minimum number of samples must be collected from the material dependent upon its type and quantity. Homogenous materials defined as non-ACM must either have 1) no asbestos identified in all of its samples or 2) an identified asbestos concentration below the appropriate regulatory threshold. Asbestos concentrations are generally determined using polarized light microscopy or transmission electron microscopy. Point counting is an analytical method to statistically quantify the percentage of asbestos in a sample. The asbestos component of ACM may either be friable or non-friable. Friable materials, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable ACM. Non-friable ACM are materials that are firmly bound in a matrix by plastic, cement, etc. and, if handled carefully, will not become friable. Federal and state regulations require that either all suspect building materials be presumed ACM or that an asbestos survey be performed prior to renovation, dismantling, demolition, or other activities that may disturb potential ACM. Notifications are required prior to demolition and/or renovation activities that may impact the condition of ACM in a building. ACM removal may be required if the ACM is likely to be disturbed or damaged during the demolition or renovation. Abatement of friable or potentially friable ACM must be performed by a licensed abatement contractor in accordance with state rules and NESHAP. Additionally, OSHA regulations for work classification, worker training and worker protection will apply.
AHERA	Asbestos Hazard Emergency Response Act
AST	Aboveground Storage Tanks. ASTs are generally described as storage tanks less than 10% of which are below ground (i.e., buried). Tanks located in a basement, but not buried, are also considered ASTs. Whether, and the extent to which, an AST is regulated, is determined on a case-by-case basis and depends upon tank size, its contents and the jurisdiction of its location.
BGS	Below Ground Surface
Brownfields	State and/or tribal listing of Brownfield properties addressed by Cooperative Agreement Recipients or Targeted Brownfields Assessments.
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes. BTEX are VOC components found in gasoline and commonly used as analytical indicators of a petroleum hydrocarbon release.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (a.k.a. Superfund). CERCLA is the federal act that regulates abandoned or uncontrolled hazardous waste sites. Under this Act, joint and several liability may be imposed on potentially responsible parties for cleanup-related costs.
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System. An EPA compilation of sites having suspected or actual releases of hazardous substances to the environment. CERCLIS also contains information on site inspections, preliminary assessments and remediation of hazardous waste sites. These sites are typically reported to EPA by states and municipalities or by third parties pursuant to CERCLA Section 103.
CESQG	Conditionally exempt small quantity generators.
CFR	Code of Federal Regulations

Description of Selected General Terms and Acronyms (cont.)

Term/Acronym	*Description*
CREC	Controlled Recognized Environmental Condition is defined in ASTM E1527-13 as "a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority) , with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls). A condition considered by the environmental professional to be a controlled recognized environmental condition shall be listed in the findings section of the Phase I Environmental Site Assessment report, and as a recognized environmental condition in the conclusions section of the Phase I Environmental Site Assessment report."
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System. An EPA-maintained federal database which stores information on notifications of oil discharges and hazardous substance releases in quantities greater than the applicable reportable quantity under CERCLA. ERNS is a cooperative data-sharing effort between EPA, DOT, and the National Response Center.
ESA	Environmental Site Assessment
FRP	Fiberglass Reinforced Plastic
Hazardous Substance	As defined under CERCLA, this is (A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33, (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title; (C) any hazardous waste having characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (with some exclusions); (D) any toxic pollutant listed under section 1317(a) of Title 33; (E) any hazardous air pollutant listed under section 112 of the Clean Air Act; and (F) any imminently hazardous chemical substance or mixture with respect to which the EPA Administrator has taken action under section 2606 of Title 15. This term does not include petroleum, including crude oil or any fraction thereof which is not otherwise listed as a hazardous substance under subparagraphs (A) through (F) above, and the term include natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).
Hazardous Waste	This is defined as having characteristics identified or listed under section 3001 of the Solid Waste Disposal Act (with some exceptions). RCRA, as amended by the Solid Waste Disposal Act of 1980, defines this term as a "solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."
HREC	Historical Recognized Environmental Condition is defined in ASTM E1527-13 as "a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted residential use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls). Before calling the past release a historical recognized environmental condition, the environmental professional must determine whether the past release is a recognized environmental condition at the time of the Phase I Environmental Site Assessment is conducted (for example, if there has been a change in the regulatory criteria). If the EP considers the past release to be a recognized environmental condition at the time the Phase I ESA is conducted, the condition shall be included in the conclusions section of the report as a recognized environmental condition."

Description of Selected General Terms and Acronyms (cont.)

Term/Acronym	*Description*
IC/EC	A listing of sites with institutional and/or engineering controls in place. IC include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls. EC include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.
ILP	Innocent Landowner/Operator Program
LQG	Large quantity generators.
LUST	Leaking Underground Storage Tank. This is a federal term set forth under RCRA for leaking USTs. Some states also utilize this term.
MCL	Maximum Contaminant Level. This Safe Drinking Water concept (and also used by many states as a ground water cleanup criteria) refers to the limit on drinking water contamination that determines whether a supplier can deliver water from a specific source without treatment.
MSDS	Material Safety Data Sheets. Written/printed forms prepared by chemical manufacturers, importers and employers which identify the physical and chemical traits of hazardous chemicals under OSHA's Hazard Communication Standard.
NESHAP	National Emissions Standard for Hazardous Air Pollutants (Federal Clean Air Act). This part of the Clean Air Act regulates emissions of hazardous air pollutants.
NFRAP	Facilities where there is "No Further Remedial Action Planned," as more particularly described under the Records Review section of this report.
NOV	Notice of Violation. A notice of violation or similar citation issued to an entity, company or individual by a state or federal regulatory body indicating a violation of applicable rule or regulations has been identified.
NPDES	National Pollutant Discharge Elimination System (Clean Water Act). The federal permit system for discharges of polluted water.
NPL	The NPL is the EPA's database of uncontrolled or abandoned hazardous waste facilities that have been listed for priority remedial actions under the Superfund Program.
OSHA	Occupational Safety and Health Administration or Occupational Safety and Health Act
PACM	Presumed Asbestos-Containing Material. A material that is suspected of containing or presumed to contain asbestos but which has not been analyzed to confirm the presence or absence of asbestos.
PCB	Polychlorinated Biphenyl. A halogenated organic compound commonly in the form of a viscous liquid or resin, a flowing yellow oil, or a waxy solid. This compound was historically used as dielectric fluid in electrical equipment (such as electrical transformers and capacitors, electrical ballasts, hydraulic and heat transfer fluids), and for numerous heat and fire sensitive applications. PCB was preferred due to its durability, stability (even at high temperatures), good chemical resistance, low volatility, flammability, and conductivity. PCBs, however, do not break down in the environment and are classified by the EPA as a suspected carcinogen. 1978 regulations, under the Toxic Substances Control Act, prohibit manufacturing of PCB-containing equipment; however, some of this equipment may still be in use today.
pCi/L	Pico Curies per Liter of Air. Unit of measurement for Radon and similar radioactive materials.
PLM	Polarized Light Microscopy (see ACM section of the report, if included in the scope of services)
PST	Petroleum Storage Tank. An AST or UST that contains a petroleum product.

Description of Selected General Terms and Acronyms (cont.)

Term/Acronym	*Description*
Radon	A radioactive gas resulting from radioactive decay of naturally-occurring radioactive materials in rocks and soils containing uranium, granite, shale, phosphate, and pitchblende. Radon concentrations are measured in Pico Curies per Liter of Air. Exposure to elevated levels of radon creates a risk of lung cancer; this risk generally increases as the level of radon and the duration of exposure increases. Outdoors, radon is diluted to such low concentrations that it usually does not present a health concern. However, radon can accumulate in building basements or similar enclosed spaces to levels that can pose a risk to human health. Indoor radon concentrations depend primarily upon the building's construction, design and the concentration of radon in the underlying soil and ground water. The EPA recommended annual average indoor "action level" concentration for residential structures is 4.0 pCi/l.
RCRA	Resource Conservation and Recovery Act. Federal act regulating solid and hazardous wastes from point of generation to time of disposal ('cradle to grave"). 42 U.S.C. 6901 et seq.
RCRA Generators	The RCRA Generators database, maintained by the EPA, lists facilities that generate hazardous waste as part of their normal business practices. Generators are listed as either large (LQG), small (SQG), or conditionally exempt (CESQG). LQG produce at least 1000 kg/month of non-acutely hazardous waste or 1 kg/month of acutely hazardous waste. SQG produce 100-1000 kg/month of non-acutely hazardous waste. CESQG are those that generate less than 100 kg/month of non-acutely hazardous waste.
RCRA CORRACTS/TSDs	The USEPA maintains a database of RCRA facilities associated with treatment, storage, and disposal (TSD) of hazardous materials which are undergoing "corrective action". A "corrective action" order is issued when there is a release of hazardous waste or constituents into the environment from a RCRA facility.
RCRA Non-CORRACTS/TSDs	The RCRA Non-CORRACTS/TSD Database is a compilation by the USEPA of facilities which report storage, transportation, treatment, or disposal of hazardous waste. Unlike the RCRA CORRACTS/TSD database, the RCRA Non-CORRACTS/TSD database does not include RCRA facilities where corrective action is required.
RCRA Violators List	RAATS. RCRA Administrative Actions Taken. RAATS information is now contained in the RCRIS database and includes records of administrative enforcement actions against facilities for noncompliance.
RCRIS	Resource Conservation and Recovery Information System, as defined in the Records Review section of this report.
REC	Recognized Environmental Conditions are defined by ASTM E1527-13 as "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: 1) due to any release to the environment; 2) under conditions indicative of a release to the environment. *De minimis* conditions are not recognized environmental conditions."
SCL	State "CERCLIS" List (see SPL /State Priority List, below).
SPCC	Spill Prevention, Control and Countermeasures. SPCC plans are required under federal law (Clean Water Act and Oil Pollution Act) for any facility storing petroleum in tanks and/or containers of 55-gallons or more that when taken in aggregate exceed 1,320 gallons. SPCC plans are also required for facilities with underground petroleum storage tanks with capacities of over 42,000 gallons. Many states have similar spill prevention programs, which may have additional requirements.
SPL	State Priority List. State list of confirmed sites having contamination in which the state is actively involved in cleanup activities or is actively pursuing potentially responsible parties for cleanup. Sometimes referred to as a State "CERCLIS" List.
SQG	Small quantity generator.
SWF/LF	State and/or Tribal database of solid waste/Landfill facilities. The database information may include the facility name, class, operation type, area, estimated operational life, and owner.
TPH	Total Petroleum Hydrocarbons
TRI	Toxic Release Inventory. Routine EPA report on releases of toxic chemicals to the environment based upon information submitted by entities subject to reporting under the Emergency Planning and Community Right to Know Act.

Description of Selected General Terms and Acronyms (cont.)

Term/Acronym	*Description*
TSCA	Toxic Substances Control Act. A federal law regulating manufacture, import, processing and distribution of chemical substances not specifically regulated by other federal laws (such as asbestos, PCBs, lead-based paint and radon). 15 U.S.C 2601 et seq.
USACE	United States Army Corps of Engineers
USC	United States Code
USGS	United States Geological Survey
USNRCS	United States Department of Agriculture-Natural Resource Conservation Service
UST	Underground Storage Tank. Most federal and state regulations, as well as ASTM E1527-13, define this as any tank, incl., underground piping connected to the tank, that is or has been used to contain hazardous substances or petroleum products and the volume of which is 10% or more beneath the surface of the ground (i.e., buried).
VCP	State and/or Tribal facilities included as Voluntary Cleanup Program sites.
VOC	Volatile Organic Compound
Wetlands	Areas that are typically saturated with surface or ground water that creates an environment supportive of wetland vegetation (i.e., swamps, marshes, bogs). The Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1) defines wetlands as areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. For an area to be considered a jurisdictional wetland, it must meet the following criteria: more than 50 percent of the dominant plant species must be categorized as Obligate, Facultative Wetland, or Facultative on lists of plant species that occur in wetlands; the soil must be hydric; and, wetland hydrology must be present. The federal Clean Water Act which regulates “waters of the US,” also regulates wetlands, a program jointly administered by the USACE and the EPA. Waters of the U.S. are defined as: (1) waters used in interstate or foreign commerce, including all waters subject to the ebb and flow of tides; (2) all interstate waters including interstate wetlands; (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, etc., which the use, degradation, or destruction could affect interstate/ foreign commerce; (4) all impoundments of waters otherwise defined as waters of the U. S., (5) tributaries of waters identified in 1 through 4 above; (6) the territorial seas; and (7) wetlands adjacent to waters identified in 1 through 6 above. Only the USACE has the authority to make a final wetlands jurisdictional determination.

Limited Site Investigation

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and

2100 Washington Street East

Charleston, Kanawha County, West Virginia

August 31, 2020

Terracon Project No. N2207019



Prepared for:

Chapman Technical Group

Saint Albans, West Virginia

Prepared by:

Terracon Consultants, Inc.

Charleston, West Virginia

August 31, 2020

Mr. Joseph E. Bird - Vice President
Chapman Technical Group
200 6th Avenue, PO Box 1355
Saint Albans, West Virginia 25177-2837

Phone: (304) 727-5501
Email: jbirg@chaptech.com

Re: Limited Site Investigation (LSI) Report
Proposed State Capitol East Campus Redevelopment
311 Jefferson Street, 312 Michigan Avenue and 2100 Washington Street East
Charleston, Kanawha County, West Virginia (the Site)
Terracon Project No. N2207019

Dear Mr. Bird:

Terracon Consultants, Inc. (Terracon) is pleased to have prepared the enclosed report for LSI services performed specific to soil sampling at the Site. Our services were performed in accordance with our Master Service Agreement, Work Order corresponding to Terracon Proposal No. PN2207019, authorized on July 31, 2020.

We appreciate the opportunity to continue serving you, please contact us if you have questions regarding this report or if we may be of further assistance.

Sincerely,
Terracon Consultants, Inc.

Prepared by:

Levi J. Sheff, AEP, CNRP
Sr. Staff Scientist

John B. Sallman
Sr. Principal

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LIMITED SITE INVESTIGATION
PROPOSED STATE CAPITOL EAST CAMPUS REDEVELOPMENT
311 JEFFERSON STREET, 312 MICHIGAN AVENUE AND 2100 WASHINGTON STREET EAST
CHARLESTON, KANAWHA COUNTY, WEST VIRGINIA

Terracon Project No. N2207019
August 31, 2020

1.0 SITE DESCRIPTION

The Site is comprised of 24 mostly paved parcels and a 1.1-acre portion of another parcel (25 total) encompassing an overall area of approximately 5.2-acres in a State Capitol Campus setting of Charleston, Kanawha County, West Virginia. There are three addresses and operations currently associated with the Site. The first operation is an approximately 4,506 square-foot (SF) three-story daycare (West Virginia Early Learning Academy) located at 2100 Washington Street East (Parcel ID: 11 28009800000000, 0.67 acres, constructed in 1936); the second is a 5,760-SF Mailroom including minor carpentry activities, located at 311 Jefferson Street (Parcel ID: 11 28008800000000, 0.13 acres, 1930) and the third is a fenced groundskeeping headquarters serving the City of Charleston (improved with eight structures: an approximately 2,500-SF tent; a 1,325-SF office; 925- and 900-SF garages; three 650-SF tents and one 50-SF storage shed, 1995-2009) at 312 Michigan Avenue. Additional Site improvements include several transformers, paved surfaces, storm drains, a potential inactive water well, and typical urban utilities. Exhibits 1 and 2 in Appendix A provide the Site location and relevant depictions.

2.0 SCOPE OF SERVICES

This limited site investigation (LSI) was performed in response to the findings and recommendations of Terracon's June 12, 2020 Phase I Environmental Site Assessment (Phase I ESA – Report No. N2207015, issued June 11, 2020), which identified the following recognized environmental conditions (RECs) in connection with the Site:

- In at least the 1930s, an automotive repair facility operated in the northwestern portion of the Site where the current Mailroom is located, and the Materials Control, Soils and Testing division (MCS&T) of the West Virginia Division of Highways operated on the northeastern portion of the Site from at least 1972-1989. The potential for associated impacts to the subsurface from the historical facility operations represented RECs to the Site.
- Garage 2 (maintenance area) had a subsurface pit with a drainage pipe corridor inside. Various aged oily stains were observed on the floor throughout the garage and within the pit, which was identified as a REC to the Site.
- A fuel station operated on the northeastern corner of Michigan Avenue and Washington Street East (southeast-adjacent to the Site and cross-gradient) from at

least 1933-1967. No related regulatory information for this fueling station was available to further evaluate if there were/are petroleum impacts in the subsurface soils/groundwater at the adjacent property for evidence of potential associated migratory impacts onto the Site. Therefore, considering the lack of information for review, the potential for related migratory impacts onto the Site represented a REC.

Our LSI services were not intended to identify/evaluate/delineate all potential hazardous substances at the Site; rather, services were limited to investigate for potential impacts associated with the referenced RECs identified in the Phase I ESA. Investigative details are described in the following sections.

2.1 Standard of Care

Terracon's services were conducted in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time. Terracon makes no warranties, either express or implied, regarding the findings, conclusions, or recommendations. Please note, Terracon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of this report. These services were conducted in accordance with the scope of services agreed with you, our client, as reflected in our proposal and were not restricted by American Society of Testing and Materials (ASTM) E1903-19.

2.2 Additional Scope Limitations

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the site activities and other services conducted under this scope of services; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, nondetectable, or not present during these services. We cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this assessment. Subsurface conditions may vary from those encountered at specific borings/wells or during other surveys, tests, assessments, investigations, or exploratory services. The data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services.

2.3 Reliance

This LSI report has been prepared for the exclusive use and reliance of Chapman Technical Group (CTG-client). Any unauthorized distribution or reuse is at the client's sole risk. Reliance on the LSI by the client and authorized parties will be subject to the terms, conditions, and limitations stated in the proposal for this authorized scope of work, the Authorization Agreement, Reliance

Agreement, and this report. The defined contractual limitation of liability is the aggregate limit of Terracon's liability to the client and all relying parties.

3.0 FIELD INVESTIGATION

Terracon conducted field work under a health and safety plan (HASP) developed for this project. Work was performed using United States Environmental Protection Agency (USEPA) Level D work attire consisting of hard hats, safety glasses, protective gloves, and protective boots. Additional to requesting public utility location services, Terracon contracted a private utility locator to assist in identifying potential private underground utility infrastructure within the proposed investigative footprint. The LSI field services were performed on August 11, 2020.

3.1 Soil and Groundwater Sampling

A total of seven temporary groundwater sampling points (SP-1 through SP-7) were installed. Four temporary sampling points were installed to at least 10 feet below grade (bg), while three temporary sampling points (SP-2, SP-4 and SP-7 [one representation per REC area]) were installed to 20 feet bg due to groundwater not being encountered while performing the scoped 10-foot installations. Groundwater was not encountered during the assessment; therefore, only soil samples were submitted for chemical analysis at a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory. Soil samples were selected by the field professional from an area most likely to exhibit evidence of a release. The soil samples were transported to the laboratory and analyzed for total petroleum hydrocarbons – gasoline/diesel range organics (TPH – GRO/DRO) and volatile organic compounds (VOCs). Samples were handled under standard chain of custody procedures and analyzed by ALS Laboratories (ALS) in Charleston, West Virginia. Field activities were completed by thin-spreading excess soil cuttings in gravel/grass-surfaced areas while backfilling the boring advancements with bentonite, and where appropriate, finished with concrete surfaces.

3.2 Geology/Hydrogeology

The soil-probe logs in Appendix B indicate the observed soil stratigraphy. In general, Terracon encountered an approximately three-inch layer of either concrete or crushed rock/gravel periodically followed by a 4-inch layer of scoria before encountering a brown and gray lean clay profile including moderate quantities of salt flecks, manganese oxidations, silts and periodic intervals of coal fragments. Moisture increases were generally observed around seven feet bg, 10 feet bg, 15 feet bg and 18 feet bg. Prior to being abandoned, Terracon allowed the temporary groundwater sampling points to recharge for the full time elapsed to complete field work; however, groundwater was not encountered.

3.3 PID Field Screening

Organic vapor readings were recorded per two-foot interval of the soil-probe advancements. PID readings were consistently less than one parts per million.

4.0 ANALYTICAL RESULTS

Laboratory analytical results are summarized on Table 1 (TPH and VOCs), and the official corresponding Report of Laboratory Analysis are provided in Appendix C. Detected concentrations in soil samples were compared to the following guidance's:

- West Virginia Department of Environmental Protection (WVDEP) – Division of Land Restoration Office of Environmental Remediation (DLROER) Quality Assurance Protection Program (QAPP); Appendix A: Typical List of Contaminants of Concerns (COCs), Leaking Underground Storage Tank (LUST) Program Action Levels, effective September 21, 2016; and,
- WVDEP – Voluntary Remediation and Redevelopment Rule (VRRR) *De Minimis* & Relative Benchmarks Table; residential/industrial screening levels (consolidated document, includes USEPA residential/industrial Regional Screening Levels [USEPA RSLs] and National Oceanic and Atmosphere (NOAA) Office of Response and Restoration – Screening Quick Reference Tables [SQuiRTs] – the most stringent thresholds were used for evaluations when more than one threshold was available), effective through the WVDEP, June 2020.

A 'J' analytical qualifier was mostly reported for TPH-DRO samples, which is defined as: Analyte is present at an estimated concentration between the minimum detection limit (MDL) and reporting limit.

TPH-GRO: Concentrations were not detected above the laboratory MDLs (ranged from less than [<] 1.6 milligrams per kilogram [mg/kg] to <2.1 mg/kg) at SP-1 through SP-7. The WVDEP-QAPP action level is 100 mg/kg.

TPH-DRO: Detected concentrations ranged from 4.9^{J} to 10 ^{J} mg/kg between two and eight feet bg in SP-1 through SP-5 and between eight and 10 feet bg in SP-6 and 18-20 feet bg at SP-7; The WVDEP-QAPP action level is 100 mg/kg.

VOCs: A 0.0120^{J} mg/kg concentration of *methylcyclohexane* was detected between two and four feet bg at SP-4; remaining analysis reported VOC concentrations below the MDLs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

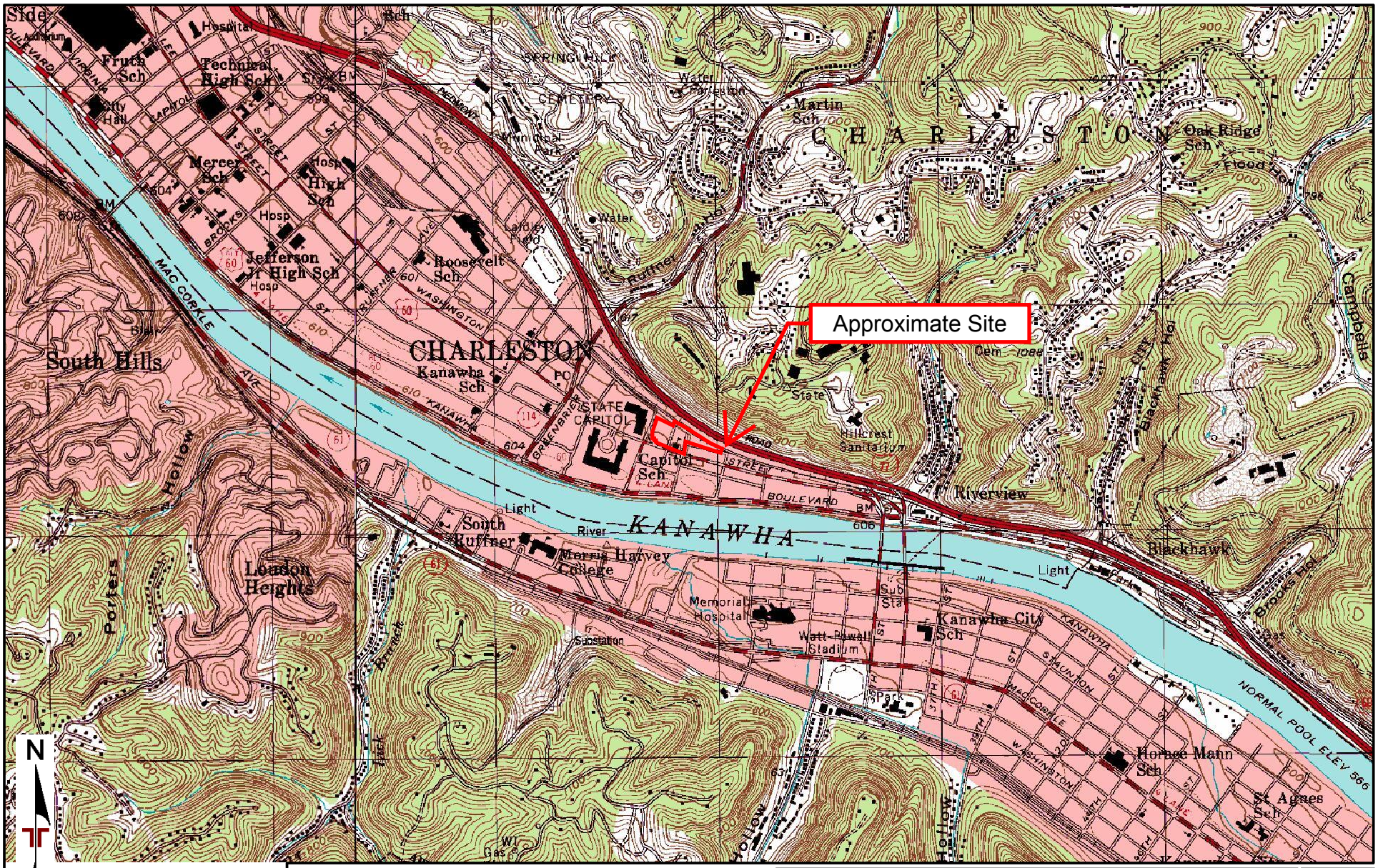
The following summary is based on the completed scope of services (subject to the limitations described herein):

Although the soil samples analyzed by the laboratory did not exhibit impacts above guidance concentrations, TPH-DRO was detected in each soil boring between two and eight feet bg across the Site (general redevelopment disturbance zone) and in some areas (SP-6 and SP-7), deeper. Additionally, the results of this LSI are limited to the specific vertical/horizontal locations of the soils selected for analysis. Due to the evidence of residual TPH-DRO impacts to soils in combination with an evident ongoing redevelopment history, Terracon recommends generation and use of a Site-specific soil management plan (SMP) to safely handle impacted soils potentially encountered during redevelopment activities.

APPENDIX A – EXHIBITS

Exhibit 1 – Topographic Map

Exhibit 2 – Site Diagram



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: CHARLESTON WEST, WV (1/1/1996) and CHARLESTON EAST, WV (1/1/1996).

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	LJS
Drawn by:	LJS
Checked by:	JBS
Approved by:	JBS

Project No.	N2207019
Scale:	1"=2,000'
File Name:	Exhibits
Date:	8/26/2020

Terracon

912 Morris St

Charleston, WV 25301-1425

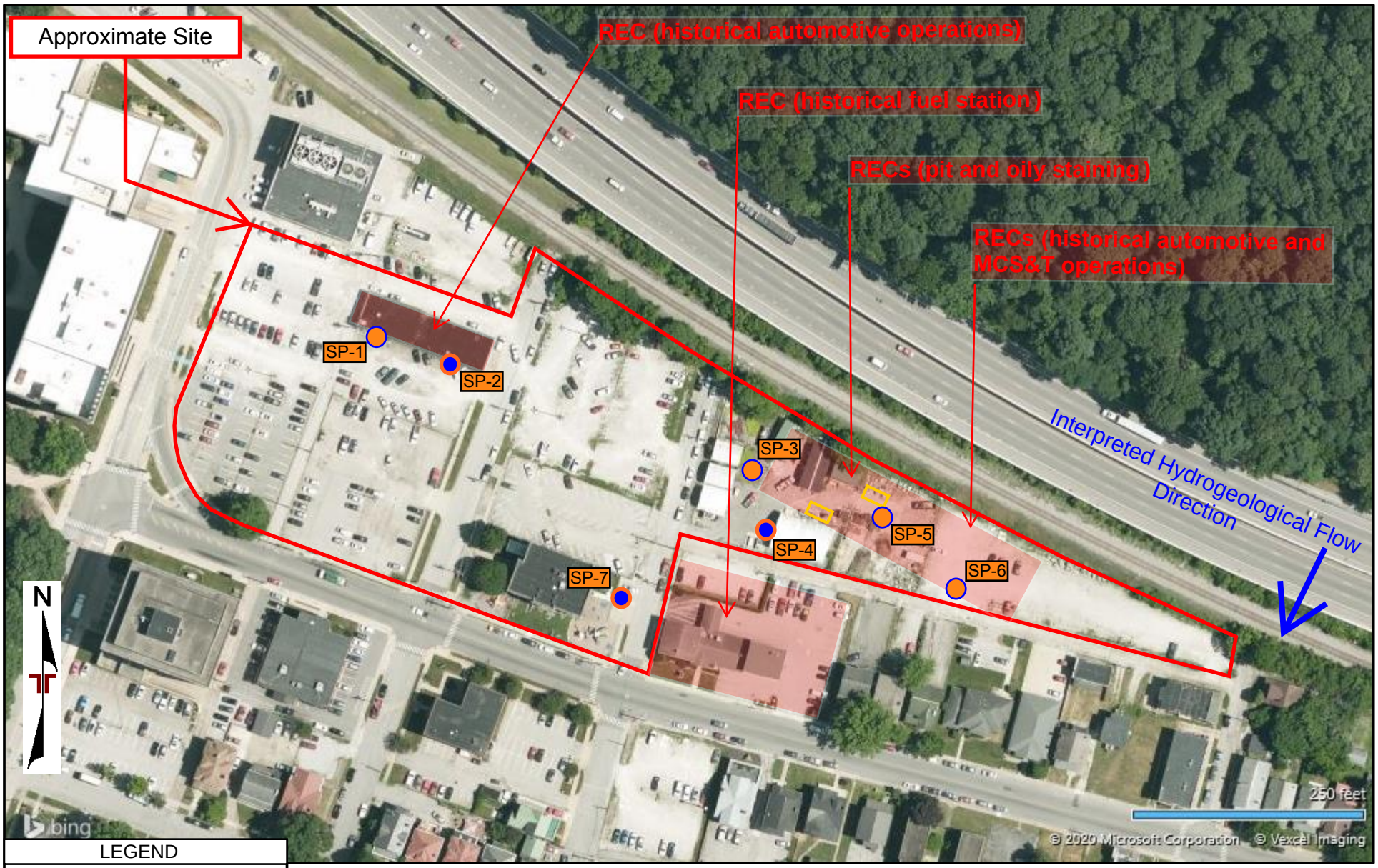
TOPOGRAPHIC MAP

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and
2100 Washington Street East, Charleston, WV

Exhibit

1



LEGEND

- = Temporary Groundwater Sampling Point (10 feet below grade)
- = Temporary Groundwater Sampling Point (20 feet below grade)

Project Manager:	LJS
Drawn by:	LJS
Checked by:	JBS
Approved by:	JBS

Project No.	N2207019
Scale:	AS SHOWN
File Name:	Exhibits
Date:	8/26/2020

Terracon
912 Morris St
Charleston, WV 25301-1425

SITE DIAGRAM

Proposed State Capitol East Campus Redevelopment

311 Jefferson Street, 312 Michigan Avenue and
2100 Washington Street East, Charleston, WV

Exhibit

2

APPENDIX B – SOIL PROBE LOGS

General Notes

Unified Soil Classification System

Probe Logs for SP-1 through SP-7

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING


Auger


Split Spoon


Shelby Tube


Macro Core


Ring Sampler


Rock Core


Grab Sample


No Recovery

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	5 - 7	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 14	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

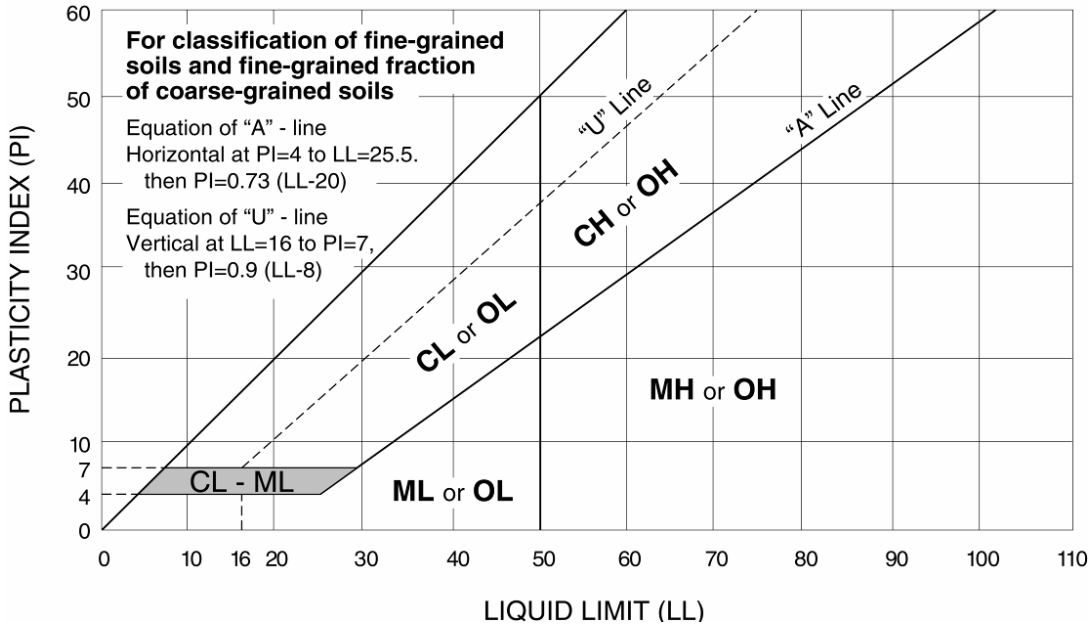
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



WELL LOG NO. SP-1

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.337705° Longitude: -81.609124°

DEPTH	MATERIAL DESCRIPTION	INSTALLATION DETAILS	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	OVA/PID (ppm)
0.2	**POORLY GRADED GRAVEL**, gray, no odor	Well Completion:				
0.8	**WELL GRADED GRAVEL (GW-GC)**, red, no odor, scoria					
	LEAN CLAY WITH SILT (CL-ML), brown, no odor, coal fragments from 8-10 feet below grade, moisture incease at 7 feet below grade	Temporay Monitoring Well	5			<1
						<1
						<1
						<1
10.0			10			<1
	Boring Terminated at 10 Feet					

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 12:15 PM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020	Well Completed: 08-11-2020
Drill Rig: Probe	Logger: LS
Project No.: N2207019	Exhibit: SP--1

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

WELL LOG NO. SP-2

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.337614° Longitude: -81.608841°

INSTALLATION DETAILS

Well Completion:

DEPTH	MATERIAL DESCRIPTION	OVA/PID (ppm)
0.2	**POORLY GRADED GRAVEL**, gray, no odor	
0.8	**WELL GRADED GRAVEL (GW-GC)**, red, no odor, scoria	
	LEAN CLAY WITH SILT (CL-ML), brown, no odor, coal fragments from 8-14 feet below grade, moisture incease at 8 feet below grade	<1
		<1
		<1
		<1
		<1
		<1
		<1
		<1
		<1
20.0	**Boring Terminated at 20 feet**	<1

Temporay Monitoring Well

DEPTH (ft): 5, 10, 15, 20

WATER LEVEL OBSERVATIONS

SAMPLE TYPE

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 11:50 AM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020 | Well Completed: 08-11-2020

Drill Rig: Probe | Logger: LS

Project No.: N2207019 | Exhibit: SP--2

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

WELL LOG NO. SP-3

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.337386° Longitude: -81.607699°

INSTALLATION DETAILS

Well Completion:

DEPTH	MATERIAL DESCRIPTION	OVA/PID (ppm)
0.2	**CONCRETE**, gray, no odor	
	SILTY CLAY WITH SAND (CL-ML), gray, no odor, salt flecks	<1
		<1
4.0	**SILTY CLAY WITH SAND (CL-ML)**, brown/gray, no odor, salt flecks	<1
		<1
10.0		<1
	Boring Terminated at 10 Feet	

Temporay Monitoring Well

DEPTH (ft): 5, 10

WATER LEVEL OBSERVATIONS

SAMPLE TYPE

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips with concrete patch upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 11:15 AM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020 | Well Completed: 08-11-2020

Drill Rig: Probe | Logger: LS

Project No.: N2207019 | Exhibit: SP--3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

WELL LOG NO. SP-4

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.337177° Longitude: -81.607649°

INSTALLATION DETAILS

Well Completion:

DEPTH	MATERIAL DESCRIPTION	OVA/PID (ppm)
0.2	**CONCRETE**, gray, no odor	
	SILTY CLAY WITH SAND (CL-ML), gray, no odor, salt flecks	<1
		<1
4.0	**SILTY CLAY WITH SAND (CL-ML)**, brown/gray, no odor, salt flecks	<1
		<1
		<1
10.0	**SILTY CLAY WITH SAND (CL-ML)**, brown, no odor	<1
12.0	**SILTY CLAY (CL-ML)**, brown, no odor, moisture increases at 15 feet and 18 feet below grade	<1
		<1
		<1
		<1
20.0	**Boring Terminated at 20 feet**	

Temporay Monitoring Well

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips with concrete patch upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 9:30 AM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020 | Well Completed: 08-11-2020

Drill Rig: Probe | Logger: LS

Project No.: N2207019 | Exhibit: SP--4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

WELL LOG NO. SP-5

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.337209° Longitude: -81.607266°

DEPTH	MATERIAL DESCRIPTION	OVA/PID (ppm)
0.2	**CONCRETE**, gray, no odor	
0.8	**WELL GRADED GRAVEL (GW-GC)**, red, no odor, scoria	
	LEAN CLAY WITH SILT (CL-ML), brown/gray, no odor	<1
		<1
4.0		
	LEAN CLAY WITH SILT (CL-ML), gray, no odor, moisture increase at 6 feet below grade, salt flecks	<1
6.0		
	LEAN CLAY WITH SILT (CL-ML), brown, no odor, salt flecks and coal fragments	<1
		<1
10.0	***Boring Terminated at 10 Feet***	

INSTALLATION DETAILS

Well Completion: Temporay Monitoring Well

DEPTH (ft): 5, 10

WATER LEVEL OBSERVATIONS

SAMPLE TYPE

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips with concrete patch upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 11:00 AM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020	Well Completed: 08-11-2020
Drill Rig: Probe	Logger: LS
Project No.: N2207019	Exhibit: SP--5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

WELL LOG NO. SP-6

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.336978° Longitude: -81.606876°

DEPTH	MATERIAL DESCRIPTION	OVA/PID (ppm)
0.2	**POORLY GRADED GRAVEL**, gray, no odor	
0.8	**WELL GRADED GRAVEL (GW-GC)**, red, no odor, scoria	
	LEAN CLAY WITH SILT (CL-ML), brown/gray, no odor	<1
		<1
4.0	**LEAN CLAY WITH SILT (CL-ML)**, gray, no odor, moisture increase at 6 feet below grade, salt flecks	<1
6.0	**LEAN CLAY WITH SILT (CL-ML)**, brown, no odor, salt flecks and coal fragments	<1
		<1
10.0	***Boring Terminated at 10 Feet***	

INSTALLATION DETAILS

Well Completion: Temporay Monitoring Well

DEPTH (ft): 5, 10

WATER LEVEL OBSERVATIONS

SAMPLE TYPE

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 10:00 AM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020 | Well Completed: 08-11-2020

Drill Rig: Probe | Logger: LS

Project No.: N2207019 | Exhibit: SP--6

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

WELL LOG NO. SP-7

PROJECT: Proposed State Capitol East Campus Redevelopment

CLIENT: Chapman Technical Group (CTG)

SITE: 311 Jefferson Street, 312 Michigan Avenue & 2100 Washington Street East, Charleston, West Virginia

LOCATION See Exhibit 2

Latitude: 38.336983° Longitude: -81.608181°

INSTALLATION DETAILS

Well Completion:

DEPTH	MATERIAL DESCRIPTION	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	OVA/PID (ppm)
0.2	**CONCRETE**, gray, no odor				
	LEAN CLAY WITH SILT (CL-ML), brown, no odor, salt flecks from 2-6 feet below grade, moisture increases at 7 feet and 18 feet below grade				<1
					<1
		5			<1
					<1
					<1
		10			<1
					<1
					<1
	Temporay Monitoring Well	15			<1
					<1
					<1
20.0	**Boring Terminated at 20 feet**	20			

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Hammer Type: Automatic

Advancement Method:
Push Probe

Abandonment Method:
Boring backfilled with soil cuttings and bentonite chips with concrete patch upon completion.

Notes:

PID readings are in isobutylene equivalents.
Terracon Rep: LJS
Sampling completed at 9:30 AM

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
912 Morris St
Charleston, WV

Well Started: 08-11-2020 | Well Completed: 08-11-2020

Drill Rig: Probe | Logger: LS

Project No.: N2207019 | Exhibit: SP--7

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ADEM SMART LOG M1197079 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 8/19/20

APPENDIX C – LABORATORY ANALYTICAL DATA

Table 1 - Soil (TPH and VOCs)

Analytical Report and Chain of Custody

Table 1
Analytical Results - Soil (TPH and VOCs)
N2207019 - Proposed State Capitol East Campus Redevelopment
311 Jefferson Street, 312 Michigan Avenue and 2100 Washington Street East
Charleston, Kanawha County, West Virginia

Sample Identification (depth in feet)	Sample Collection Date	Total Petroleum Hydrocarbons (USEPA Method 8015)		Volatile Organic Compounds (USEPA Method 8260)
		Gasoline Range Organics	***Diesel Range Organics***	***Methylcyclohexane***
		mg/kg	mg/kg	mg/kg
SP-1 (6-8)	8/11/2020	<2.1	6.9[J]	<0.0057
SP-2 (2-4)		<1.9	6.2[J]	<0.0053
SP-3 (6-8)		<1.8	10[J]	<0.0050
SP-4 (2-4)		<2.1	5.6[J]	0.0120[J]
SP-5 (4-6)		<2.0	6.6[J]	<0.0056
SP-6 (8-10)		<1.8	5.3[J]	<0.0048
SP-7 (18-20)		<1.6	4.9[J]	<0.0043
WVQAPP[1]		**100**	**100**	**References[2]**
WVDEP De Minimis[2] - Residential		**NE**	**NE**	**NE**
WVDEP De Minimis[2] - Industrial		**NE**	**NE**	**NE**
WVDEP De Minimis[2] - NOAA/Mammals		**NE**	**NE**	**NE**

Unit of measure is reported in milligrams per kilogram (mg/kg), equivalent to parts per million (ppm).

[1] West Virginia Department of Environmental Protection (WVDEP) – Division of Land Restoration Office of Environmental Remediation (DLROER) – Quality Assurance Program Plan (QAPP); Appendix A: Typical List of Contaminants of Concerns (COCs), Leaking Underground Storage Tank (LUST) Program Action Levels, effective September 21, 2016.

[2] WVDEP – Voluntary Remediation and Redevelopment Rule (VRRR) De Minimis & Relative Benchmarks Table; residential/industrial screening levels (consolidated document, includes United States Environmental Protection Agency residential/industrial Regional Screening Levels [ESEPA RSLs] and National Oceanic and Atmosphere (NOAA) Office of Response and Restoration – Screening Quick Reference Tables [SQuiRTs] – the most stringent thresholds were used for evaluations when more than one threshold was available), effective through WVDEP, June 2020.

J = Analyte is present at an estimated concentration between the minimum detection limit (MDL) and reporting limit.
NE = Not established.
ND = Less than the associated MDLs for analyte range.
< = Less than the associated MDL.
Bold/Highlighted = Result exceeds the respective and most stringent regulatory limit.

25-Aug-2020

Levi Sheff
Terracon
912 Morris Street
Charleston, WV 25301

Re: **N2207019** Work Order: **20080750**

Dear Levi,

ALS Environmental received 8 samples on 11-Aug-2020 01:34 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 55.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

Rebecca Kiser

Electronically approved by: Rebecca Kiser

Rebecca Kiser
Project Manager

Report of Laboratory Analysis

Certificate No: WV: 355

ALS Group, USA

Date: 25-Aug-20

Client: Terracon
Project: N2207019
Work Order: **20080750**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
20080750-01	SP-1 (6'-8') Grab	Soil		8/11/2020 12:15	8/13/2020 10:30	☐
20080750-02	SP-2 (2'-4') Grab	Soil		8/11/2020 11:50	8/13/2020 10:30	☐
20080750-03	SP-3 (6'-8') Grab	Soil		8/11/2020 11:15	8/13/2020 10:30	☐
20080750-04	SP-4 (2'-4') Grab	Soil		8/11/2020 09:30	8/13/2020 10:30	☐
20080750-05	SP-5 (4'-6') Grab	Soil		8/11/2020 11:00	8/13/2020 10:30	☐
20080750-06	SP-6 (8'-10') Grab	Soil		8/11/2020 10:00	8/13/2020 10:30	☐
20080750-07	SP-7 (18'-20') Grab	Soil		8/11/2020 10:30	8/13/2020 10:30	☐
20080750-08	Trip Blank Grab	Water		8/11/2020 09:30	8/13/2020 10:30	☐

ALS Group, USA

Date: 25-Aug-20

Client: Terracon
Project: N2207019
Work Order: 20080750

Case Narrative

Samples for the above noted Work Order were received on 08/11/2020. The attached "Sample Receipt Checklist" documents the status of custody seals, container integrity, preservation, and temperature compliance.

Samples were analyzed according to the analytical methodology previously transmitted in the "Work Order Acknowledgement". Methodologies are also documented in the "Analytical Result" section for each sample. Quality control results are listed in the "QC Report" section. Sample association for the reported quality control is located at the end of each batch summary. If applicable, results are appropriately qualified in the Analytical Result and QC Report sections. The "Qualifiers" section documents the various qualifiers, units, and acronyms utilized in reporting. A copy of the laboratory's scope of accreditation is available upon request.

With the following exceptions, all sample analyses achieved analytical criteria.

Volatile Organics:
No other deviations or anomalies were noted.

Extractable Organics:
No other deviations or anomalies were noted.

Wet Chemistry:
No other deviations or anomalies were noted.

Client: Terracon
Project: N2207019
WorkOrder: **20080750**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
**	Estimated Value
a	Analyte is non-accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
Hr	BOD/CBOD - Sample was reset outside Hold Time, value should be considered estimated.
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
% of sample	Percent of Sample
µg/Kg-dry	Micrograms per Kilogram Dry Weight
µg/L	Micrograms per Liter
mg/Kg-dry	Milligrams per Kilogram Dry Weight

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-1 (6'-8') Grab
Collection Date: 8/11/2020 12:15 PM

Work Order: 20080750
Lab ID: 20080750-01
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**6.9**	J	**3.4**	**12**	**mg/Kg-dry**	1	8/19/2020 03:42
Surr: 4-Terphenyl-d14	*92.2*			*33-111*	*%REC*	1	8/19/2020 03:42
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		2,100	5,000	µg/Kg-dry	1	8/14/2020 11:20
Surr: Toluene-d8	*92.7*			*71-123*	*%REC*	1	8/14/2020 11:20
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		6.8	15	µg/Kg-dry	1	8/18/2020 22:57
1,1,2,2-Tetrachloroethane	U		6.6	15	µg/Kg-dry	1	8/18/2020 22:57
1,1,2-Trichloroethane	U		6.3	15	µg/Kg-dry	1	8/18/2020 22:57
1,1,2-Trichlorotrifluoroethane	U		9.4	15	µg/Kg-dry	1	8/18/2020 22:57
1,1-Dichloroethane	U		5.4	15	µg/Kg-dry	1	8/18/2020 22:57
1,1-Dichloroethene	U		4.8	15	µg/Kg-dry	1	8/18/2020 22:57
1,2,3-Trichlorobenzene	U		18	50	µg/Kg-dry	1	8/18/2020 22:57
1,2,4-Trichlorobenzene	U		17	50	µg/Kg-dry	1	8/18/2020 22:57
1,2-Dibromo-3-chloropropane	U		14	50	µg/Kg-dry	1	8/18/2020 22:57
1,2-Dibromoethane	U		4.2	15	µg/Kg-dry	1	8/18/2020 22:57
1,2-Dichlorobenzene	U		5.6	15	µg/Kg-dry	1	8/18/2020 22:57
1,2-Dichloroethane	U		22	50	µg/Kg-dry	1	8/18/2020 22:57
1,2-Dichloropropane	U		11	15	µg/Kg-dry	1	8/18/2020 22:57
1,3-Dichlorobenzene	U		5.0	15	µg/Kg-dry	1	8/18/2020 22:57
1,4-Dichlorobenzene	U		3.6	15	µg/Kg-dry	1	8/18/2020 22:57
2-Butanone	U		12	99	µg/Kg-dry	1	8/18/2020 22:57
2-Hexanone	U		7.4	15	µg/Kg-dry	1	8/18/2020 22:57
4-Methyl-2-pentanone	U		14	15	µg/Kg-dry	1	8/18/2020 22:57
Acetone	U		44	50	µg/Kg-dry	1	8/18/2020 22:57
Benzene	U		2.5	15	µg/Kg-dry	1	8/18/2020 22:57
Bromochloromethane	U		7.6	15	µg/Kg-dry	1	8/18/2020 22:57
Bromodichloromethane	U		8.3	15	µg/Kg-dry	1	8/18/2020 22:57
Bromoform	U		6.3	15	µg/Kg-dry	1	8/18/2020 22:57
Bromomethane	U		28	50	µg/Kg-dry	1	8/18/2020 22:57
Carbon disulfide	U		7.7	15	µg/Kg-dry	1	8/18/2020 22:57
Carbon tetrachloride	U		5.8	15	µg/Kg-dry	1	8/18/2020 22:57
Chlorobenzene	U		4.9	15	µg/Kg-dry	1	8/18/2020 22:57
Chloroethane	U		15	50	µg/Kg-dry	1	8/18/2020 22:57
Chloroform	U		5.5	15	µg/Kg-dry	1	8/18/2020 22:57
Chloromethane	U		41	50	µg/Kg-dry	1	8/18/2020 22:57
cis-1,2-Dichloroethene	U		4.7	15	µg/Kg-dry	1	8/18/2020 22:57

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-1 (6'-8') Grab
Collection Date: 8/11/2020 12:15 PM

Work Order: 20080750
Lab ID: 20080750-01
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		11	15	µg/Kg-dry	1	8/18/2020 22:57
Cyclohexane	U		4.8	50	µg/Kg-dry	1	8/18/2020 22:57
Dibromochloromethane	U		8.4	15	µg/Kg-dry	1	8/18/2020 22:57
Dichlorodifluoromethane	U		18	50	µg/Kg-dry	1	8/18/2020 22:57
Ethylbenzene	U		3.1	15	µg/Kg-dry	1	8/18/2020 22:57
Isopropylbenzene	U		4.5	15	µg/Kg-dry	1	8/18/2020 22:57
m,p-Xylene	U		20	30	µg/Kg-dry	1	8/18/2020 22:57
Methyl acetate	U		18	120	µg/Kg-dry	1	8/18/2020 22:57
Methyl tert-butyl ether	U		4.3	15	µg/Kg-dry	1	8/18/2020 22:57
Methylcyclohexane	U		5.7	15	µg/Kg-dry	1	8/18/2020 22:57
Methylene chloride	U		39	120	µg/Kg-dry	1	8/18/2020 22:57
o-Xylene	U		5.8	15	µg/Kg-dry	1	8/18/2020 22:57
Styrene	U		5.9	15	µg/Kg-dry	1	8/18/2020 22:57
Tetrachloroethene	U		4.3	15	µg/Kg-dry	1	8/18/2020 22:57
Toluene	U		4.1	15	µg/Kg-dry	1	8/18/2020 22:57
trans-1,2-Dichloroethene	U		5.5	15	µg/Kg-dry	1	8/18/2020 22:57
trans-1,3-Dichloropropene	U		8.3	15	µg/Kg-dry	1	8/18/2020 22:57
Trichloroethene	U		6.7	15	µg/Kg-dry	1	8/18/2020 22:57
Trichlorofluoromethane	U		7.6	15	µg/Kg-dry	1	8/18/2020 22:57
Vinyl chloride	U		9.9	15	µg/Kg-dry	1	8/18/2020 22:57
1,2-Dichloroethene, Total	U		5.5	30	µg/Kg-dry	1	8/18/2020 22:57
1,3-Dichloropropene, Total	U		11	30	µg/Kg-dry	1	8/18/2020 22:57
Xylenes, Total	U		20	45	µg/Kg-dry	1	8/18/2020 22:57
Surr: 1,2-Dichloroethane-d4	*106*			*70-130*	*%REC*	1	8/18/2020 22:57
Surr: 4-Bromofluorobenzene	*102*			*70-130*	*%REC*	1	8/18/2020 22:57
Surr: Dibromofluoromethane	*98.1*			*70-130*	*%REC*	1	8/18/2020 22:57
Surr: Toluene-d8	*97.5*			*70-130*	*%REC*	1	8/18/2020 22:57
MOISTURE		Method:**SW3550C**					Analyst: **KTP**
Moisture	**17**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-2 (2'-4') Grab
Collection Date: 8/11/2020 11:50 AM

Work Order: 20080750
Lab ID: 20080750-02
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**6.2**	J	**3.4**	**12**	**mg/Kg-dry**	1	8/19/2020 04:21
Surr: 4-Terphenyl-d14	*89.0*			*33-111*	*%REC*	1	8/19/2020 04:21
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		1,900	4,600	µg/Kg-dry	1	8/14/2020 11:43
Surr: Toluene-d8	*91.9*			*71-123*	*%REC*	1	8/14/2020 11:43
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		6.3	14	µg/Kg-dry	1	8/18/2020 23:13
1,1,2,2-Tetrachloroethane	U		6.1	14	µg/Kg-dry	1	8/18/2020 23:13
1,1,2-Trichloroethane	U		5.9	14	µg/Kg-dry	1	8/18/2020 23:13
1,1,2-Trichlorotrifluoroethane	U		8.8	14	µg/Kg-dry	1	8/18/2020 23:13
1,1-Dichloroethane	U		5.1	14	µg/Kg-dry	1	8/18/2020 23:13
1,1-Dichloroethene	U		4.5	14	µg/Kg-dry	1	8/18/2020 23:13
1,2,3-Trichlorobenzene	U		17	46	µg/Kg-dry	1	8/18/2020 23:13
1,2,4-Trichlorobenzene	U		16	46	µg/Kg-dry	1	8/18/2020 23:13
1,2-Dibromo-3-chloropropane	U		13	46	µg/Kg-dry	1	8/18/2020 23:13
1,2-Dibromoethane	U		3.9	14	µg/Kg-dry	1	8/18/2020 23:13
1,2-Dichlorobenzene	U		5.3	14	µg/Kg-dry	1	8/18/2020 23:13
1,2-Dichloroethane	U		21	46	µg/Kg-dry	1	8/18/2020 23:13
1,2-Dichloropropane	U		10	14	µg/Kg-dry	1	8/18/2020 23:13
1,3-Dichlorobenzene	U		4.6	14	µg/Kg-dry	1	8/18/2020 23:13
1,4-Dichlorobenzene	U		3.4	14	µg/Kg-dry	1	8/18/2020 23:13
2-Butanone	U		11	93	µg/Kg-dry	1	8/18/2020 23:13
2-Hexanone	U		6.9	14	µg/Kg-dry	1	8/18/2020 23:13
4-Methyl-2-pentanone	U		13	14	µg/Kg-dry	1	8/18/2020 23:13
Acetone	U		41	46	µg/Kg-dry	1	8/18/2020 23:13
Benzene	U		2.4	14	µg/Kg-dry	1	8/18/2020 23:13
Bromochloromethane	U		7.1	14	µg/Kg-dry	1	8/18/2020 23:13
Bromodichloromethane	U		7.8	14	µg/Kg-dry	1	8/18/2020 23:13
Bromoform	U		5.9	14	µg/Kg-dry	1	8/18/2020 23:13
Bromomethane	U		27	46	µg/Kg-dry	1	8/18/2020 23:13
Carbon disulfide	U		7.2	14	µg/Kg-dry	1	8/18/2020 23:13
Carbon tetrachloride	U		5.5	14	µg/Kg-dry	1	8/18/2020 23:13
Chlorobenzene	U		4.6	14	µg/Kg-dry	1	8/18/2020 23:13
Chloroethane	U		14	46	µg/Kg-dry	1	8/18/2020 23:13
Chloroform	U		5.1	14	µg/Kg-dry	1	8/18/2020 23:13
Chloromethane	U		38	46	µg/Kg-dry	1	8/18/2020 23:13
cis-1,2-Dichloroethene	U		4.4	14	µg/Kg-dry	1	8/18/2020 23:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-2 (2'-4') Grab
Collection Date: 8/11/2020 11:50 AM

Work Order: 20080750
Lab ID: 20080750-02
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		10	14	µg/Kg-dry	1	8/18/2020 23:13
Cyclohexane	U		4.5	46	µg/Kg-dry	1	8/18/2020 23:13
Dibromochloromethane	U		7.8	14	µg/Kg-dry	1	8/18/2020 23:13
Dichlorodifluoromethane	U		17	46	µg/Kg-dry	1	8/18/2020 23:13
Ethylbenzene	U		2.9	14	µg/Kg-dry	1	8/18/2020 23:13
Isopropylbenzene	U		4.2	14	µg/Kg-dry	1	8/18/2020 23:13
m,p-Xylene	U		19	28	µg/Kg-dry	1	8/18/2020 23:13
Methyl acetate	U		17	120	µg/Kg-dry	1	8/18/2020 23:13
Methyl tert-butyl ether	U		4.0	14	µg/Kg-dry	1	8/18/2020 23:13
Methylcyclohexane	U		5.3	14	µg/Kg-dry	1	8/18/2020 23:13
Methylene chloride	U		37	120	µg/Kg-dry	1	8/18/2020 23:13
o-Xylene	U		5.4	14	µg/Kg-dry	1	8/18/2020 23:13
Styrene	U		5.5	14	µg/Kg-dry	1	8/18/2020 23:13
Tetrachloroethene	U		4.1	14	µg/Kg-dry	1	8/18/2020 23:13
Toluene	U		3.8	14	µg/Kg-dry	1	8/18/2020 23:13
trans-1,2-Dichloroethene	U		5.1	14	µg/Kg-dry	1	8/18/2020 23:13
trans-1,3-Dichloropropene	U		7.8	14	µg/Kg-dry	1	8/18/2020 23:13
Trichloroethene	U		6.2	14	µg/Kg-dry	1	8/18/2020 23:13
Trichlorofluoromethane	U		7.1	14	µg/Kg-dry	1	8/18/2020 23:13
Vinyl chloride	U		9.3	14	µg/Kg-dry	1	8/18/2020 23:13
1,2-Dichloroethene, Total	U		5.1	28	µg/Kg-dry	1	8/18/2020 23:13
1,3-Dichloropropene, Total	U		10	28	µg/Kg-dry	1	8/18/2020 23:13
Xylenes, Total	U		19	42	µg/Kg-dry	1	8/18/2020 23:13
Surr: 1,2-Dichloroethane-d4	*106*			*70-130*	*%REC*	1	8/18/2020 23:13
Surr: 4-Bromofluorobenzene	*105*			*70-130*	*%REC*	1	8/18/2020 23:13
Surr: Dibromofluoromethane	*98.7*			*70-130*	*%REC*	1	8/18/2020 23:13
Surr: Toluene-d8	*98.9*			*70-130*	*%REC*	1	8/18/2020 23:13
MOISTURE		Method: **SW3550C**					Analyst: **KTP**
Moisture	**17**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-3 (6'-8') Grab
Collection Date: 8/11/2020 11:15 AM

Work Order: 20080750
Lab ID: 20080750-03
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**10**	J	**3.5**	**12**	**mg/Kg-dry**	1	8/19/2020 04:59
Surr: 4-Terphenyl-d14	*86.7*			*33-111*	*%REC*	1	8/19/2020 04:59
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		1,800	4,400	µg/Kg-dry	1	8/14/2020 12:06
Surr: Toluene-d8	*92.4*			*71-123*	*%REC*	1	8/14/2020 12:06
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		5.9	13	µg/Kg-dry	1	8/18/2020 23:29
1,1,2,2-Tetrachloroethane	U		5.8	13	µg/Kg-dry	1	8/18/2020 23:29
1,1,2-Trichloroethane	U		5.6	13	µg/Kg-dry	1	8/18/2020 23:29
1,1,2-Trichlorotrifluoroethane	U		8.3	13	µg/Kg-dry	1	8/18/2020 23:29
1,1-Dichloroethane	U		4.8	13	µg/Kg-dry	1	8/18/2020 23:29
1,1-Dichloroethene	U		4.2	13	µg/Kg-dry	1	8/18/2020 23:29
1,2,3-Trichlorobenzene	U		16	44	µg/Kg-dry	1	8/18/2020 23:29
1,2,4-Trichlorobenzene	U		15	44	µg/Kg-dry	1	8/18/2020 23:29
1,2-Dibromo-3-chloropropane	U		12	44	µg/Kg-dry	1	8/18/2020 23:29
1,2-Dibromoethane	U		3.7	13	µg/Kg-dry	1	8/18/2020 23:29
1,2-Dichlorobenzene	U		5.0	13	µg/Kg-dry	1	8/18/2020 23:29
1,2-Dichloroethane	U		20	44	µg/Kg-dry	1	8/18/2020 23:29
1,2-Dichloropropane	U		9.6	13	µg/Kg-dry	1	8/18/2020 23:29
1,3-Dichlorobenzene	U		4.4	13	µg/Kg-dry	1	8/18/2020 23:29
1,4-Dichlorobenzene	U		3.2	13	µg/Kg-dry	1	8/18/2020 23:29
2-Butanone	U		11	87	µg/Kg-dry	1	8/18/2020 23:29
2-Hexanone	U		6.5	13	µg/Kg-dry	1	8/18/2020 23:29
4-Methyl-2-pentanone	U		12	13	µg/Kg-dry	1	8/18/2020 23:29
Acetone	U		39	44	µg/Kg-dry	1	8/18/2020 23:29
Benzene	U		2.2	13	µg/Kg-dry	1	8/18/2020 23:29
Bromochloromethane	U		6.7	13	µg/Kg-dry	1	8/18/2020 23:29
Bromodichloromethane	U		7.3	13	µg/Kg-dry	1	8/18/2020 23:29
Bromoform	U		5.5	13	µg/Kg-dry	1	8/18/2020 23:29
Bromomethane	U		25	44	µg/Kg-dry	1	8/18/2020 23:29
Carbon disulfide	U		6.8	13	µg/Kg-dry	1	8/18/2020 23:29
Carbon tetrachloride	U		5.1	13	µg/Kg-dry	1	8/18/2020 23:29
Chlorobenzene	U		4.3	13	µg/Kg-dry	1	8/18/2020 23:29
Chloroethane	U		13	44	µg/Kg-dry	1	8/18/2020 23:29
Chloroform	U		4.8	13	µg/Kg-dry	1	8/18/2020 23:29
Chloromethane	U		36	44	µg/Kg-dry	1	8/18/2020 23:29
cis-1,2-Dichloroethene	U		4.1	13	µg/Kg-dry	1	8/18/2020 23:29

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-3 (6'-8') Grab
Collection Date: 8/11/2020 11:15 AM

Work Order: 20080750
Lab ID: 20080750-03
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		9.9	13	µg/Kg-dry	1	8/18/2020 23:29
Cyclohexane	U		4.3	44	µg/Kg-dry	1	8/18/2020 23:29
Dibromochloromethane	U		7.4	13	µg/Kg-dry	1	8/18/2020 23:29
Dichlorodifluoromethane	U		16	44	µg/Kg-dry	1	8/18/2020 23:29
Ethylbenzene	U		2.8	13	µg/Kg-dry	1	8/18/2020 23:29
Isopropylbenzene	U		4.0	13	µg/Kg-dry	1	8/18/2020 23:29
m,p-Xylene	U		17	26	µg/Kg-dry	1	8/18/2020 23:29
Methyl acetate	U		16	110	µg/Kg-dry	1	8/18/2020 23:29
Methyl tert-butyl ether	U		3.8	13	µg/Kg-dry	1	8/18/2020 23:29
Methylcyclohexane	U		5.0	13	µg/Kg-dry	1	8/18/2020 23:29
Methylene chloride	U		35	110	µg/Kg-dry	1	8/18/2020 23:29
o-Xylene	U		5.1	13	µg/Kg-dry	1	8/18/2020 23:29
Styrene	U		5.2	13	µg/Kg-dry	1	8/18/2020 23:29
Tetrachloroethene	U		3.8	13	µg/Kg-dry	1	8/18/2020 23:29
Toluene	U		3.6	13	µg/Kg-dry	1	8/18/2020 23:29
trans-1,2-Dichloroethene	U		4.8	13	µg/Kg-dry	1	8/18/2020 23:29
trans-1,3-Dichloropropene	U		7.3	13	µg/Kg-dry	1	8/18/2020 23:29
Trichloroethene	U		5.9	13	µg/Kg-dry	1	8/18/2020 23:29
Trichlorofluoromethane	U		6.7	13	µg/Kg-dry	1	8/18/2020 23:29
Vinyl chloride	U		8.7	13	µg/Kg-dry	1	8/18/2020 23:29
1,2-Dichloroethene, Total	U		4.8	26	µg/Kg-dry	1	8/18/2020 23:29
1,3-Dichloropropene, Total	U		9.9	26	µg/Kg-dry	1	8/18/2020 23:29
Xylenes, Total	U		17	39	µg/Kg-dry	1	8/18/2020 23:29
Surr: 1,2-Dichloroethane-d4	*103*			*70-130*	*%REC*	1	8/18/2020 23:29
Surr: 4-Bromofluorobenzene	*103*			*70-130*	*%REC*	1	8/18/2020 23:29
Surr: Dibromofluoromethane	*101*			*70-130*	*%REC*	1	8/18/2020 23:29
Surr: Toluene-d8	*98.7*			*70-130*	*%REC*	1	8/18/2020 23:29
MOISTURE		Method: **SW3550C**					Analyst: **KTP**
Moisture	**20**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-4 (2'-4') Grab
Collection Date: 8/11/2020 09:30 AM

Work Order: 20080750
Lab ID: 20080750-04
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**5.6**	J	**3.4**	**12**	**mg/Kg-dry**	1	8/19/2020 05:38
Surr: 4-Terphenyl-d14	*87.9*			*33-111*	*%REC*	1	8/19/2020 05:38
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		2,100	4,900	µg/Kg-dry	1	8/14/2020 12:29
Surr: Toluene-d8	*91.2*			*71-123*	*%REC*	1	8/14/2020 12:29
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		6.7	15	µg/Kg-dry	1	8/18/2020 23:46
1,1,2,2-Tetrachloroethane	U		6.5	15	µg/Kg-dry	1	8/18/2020 23:46
1,1,2-Trichloroethane	U		6.3	15	µg/Kg-dry	1	8/18/2020 23:46
1,1,2-Trichlorotrifluoroethane	U		9.3	15	µg/Kg-dry	1	8/18/2020 23:46
1,1-Dichloroethane	U		5.4	15	µg/Kg-dry	1	8/18/2020 23:46
1,1-Dichloroethene	U		4.8	15	µg/Kg-dry	1	8/18/2020 23:46
1,2,3-Trichlorobenzene	U		18	49	µg/Kg-dry	1	8/18/2020 23:46
1,2,4-Trichlorobenzene	U		17	49	µg/Kg-dry	1	8/18/2020 23:46
1,2-Dibromo-3-chloropropane	U		14	49	µg/Kg-dry	1	8/18/2020 23:46
1,2-Dibromoethane	U		4.1	15	µg/Kg-dry	1	8/18/2020 23:46
1,2-Dichlorobenzene	U		5.6	15	µg/Kg-dry	1	8/18/2020 23:46
1,2-Dichloroethane	U		22	49	µg/Kg-dry	1	8/18/2020 23:46
1,2-Dichloropropane	U		11	15	µg/Kg-dry	1	8/18/2020 23:46
1,3-Dichlorobenzene	U		4.9	15	µg/Kg-dry	1	8/18/2020 23:46
1,4-Dichlorobenzene	U		3.6	15	µg/Kg-dry	1	8/18/2020 23:46
2-Butanone	U		12	98	µg/Kg-dry	1	8/18/2020 23:46
2-Hexanone	U		7.3	15	µg/Kg-dry	1	8/18/2020 23:46
4-Methyl-2-pentanone	U		14	15	µg/Kg-dry	1	8/18/2020 23:46
Acetone	U		44	49	µg/Kg-dry	1	8/18/2020 23:46
Benzene	U		2.5	15	µg/Kg-dry	1	8/18/2020 23:46
Bromochloromethane	U		7.5	15	µg/Kg-dry	1	8/18/2020 23:46
Bromodichloromethane	U		8.3	15	µg/Kg-dry	1	8/18/2020 23:46
Bromoform	U		6.2	15	µg/Kg-dry	1	8/18/2020 23:46
Bromomethane	U		28	49	µg/Kg-dry	1	8/18/2020 23:46
Carbon disulfide	U		7.6	15	µg/Kg-dry	1	8/18/2020 23:46
Carbon tetrachloride	U		5.8	15	µg/Kg-dry	1	8/18/2020 23:46
Chlorobenzene	U		4.9	15	µg/Kg-dry	1	8/18/2020 23:46
Chloroethane	U		14	49	µg/Kg-dry	1	8/18/2020 23:46
Chloroform	U		5.4	15	µg/Kg-dry	1	8/18/2020 23:46
Chloromethane	U		40	49	µg/Kg-dry	1	8/18/2020 23:46
cis-1,2-Dichloroethene	U		4.6	15	µg/Kg-dry	1	8/18/2020 23:46

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-4 (2'-4') Grab
Collection Date: 8/11/2020 09:30 AM

Work Order: 20080750
Lab ID: 20080750-04
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		11	15	µg/Kg-dry	1	8/18/2020 23:46
Cyclohexane	U		4.8	49	µg/Kg-dry	1	8/18/2020 23:46
Dibromochloromethane	U		8.3	15	µg/Kg-dry	1	8/18/2020 23:46
Dichlorodifluoromethane	U		18	49	µg/Kg-dry	1	8/18/2020 23:46
Ethylbenzene	U		3.1	15	µg/Kg-dry	1	8/18/2020 23:46
Isopropylbenzene	U		4.5	15	µg/Kg-dry	1	8/18/2020 23:46
m,p-Xylene	U		20	29	µg/Kg-dry	1	8/18/2020 23:46
Methyl acetate	U		18	120	µg/Kg-dry	1	8/18/2020 23:46
Methyl tert-butyl ether	U		4.2	15	µg/Kg-dry	1	8/18/2020 23:46
Methylcyclohexane	**12**	J	**5.6**	**15**	**µg/Kg-dry**	1	8/18/2020 23:46
Methylene chloride	U		39	120	µg/Kg-dry	1	8/18/2020 23:46
o-Xylene	U		5.7	15	µg/Kg-dry	1	8/18/2020 23:46
Styrene	U		5.8	15	µg/Kg-dry	1	8/18/2020 23:46
Tetrachloroethene	U		4.3	15	µg/Kg-dry	1	8/18/2020 23:46
Toluene	U		4.0	15	µg/Kg-dry	1	8/18/2020 23:46
trans-1,2-Dichloroethene	U		5.4	15	µg/Kg-dry	1	8/18/2020 23:46
trans-1,3-Dichloropropene	U		8.2	15	µg/Kg-dry	1	8/18/2020 23:46
Trichloroethene	U		6.6	15	µg/Kg-dry	1	8/18/2020 23:46
Trichlorofluoromethane	U		7.5	15	µg/Kg-dry	1	8/18/2020 23:46
Vinyl chloride	U		9.8	15	µg/Kg-dry	1	8/18/2020 23:46
1,2-Dichloroethene, Total	U		5.4	29	µg/Kg-dry	1	8/18/2020 23:46
1,3-Dichloropropene, Total	U		11	29	µg/Kg-dry	1	8/18/2020 23:46
Xylenes, Total	U		20	44	µg/Kg-dry	1	8/18/2020 23:46
Surr: 1,2-Dichloroethane-d4	*101*			*70-130*	*%REC*	1	8/18/2020 23:46
Surr: 4-Bromofluorobenzene	*104*			*70-130*	*%REC*	1	8/18/2020 23:46
Surr: Dibromofluoromethane	*97.2*			*70-130*	*%REC*	1	8/18/2020 23:46
Surr: Toluene-d8	*100*			*70-130*	*%REC*	1	8/18/2020 23:46
MOISTURE		Method: **SW3550C**					Analyst: **KTP**
Moisture	**18**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-5 (4'-6') Grab
Collection Date: 8/11/2020 11:00 AM

Work Order: 20080750
Lab ID: 20080750-05
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**6.6**	J	**3.4**	**12**	**mg/Kg-dry**	1	8/18/2020 23:49
Surr: 4-Terphenyl-d14	*91.2*			*33-111*	*%REC*	1	8/18/2020 23:49
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		2,000	4,900	µg/Kg-dry	1	8/14/2020 10:57
Surr: Toluene-d8	*94.5*			*71-123*	*%REC*	1	8/14/2020 10:57
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		6.7	15	µg/Kg-dry	1	8/19/2020 00:02
1,1,2,2-Tetrachloroethane	U		6.5	15	µg/Kg-dry	1	8/19/2020 00:02
1,1,2-Trichloroethane	U		6.2	15	µg/Kg-dry	1	8/19/2020 00:02
1,1,2-Trichlorotrifluoroethane	U		9.3	15	µg/Kg-dry	1	8/19/2020 00:02
1,1-Dichloroethane	U		5.4	15	µg/Kg-dry	1	8/19/2020 00:02
1,1-Dichloroethene	U		4.8	15	µg/Kg-dry	1	8/19/2020 00:02
1,2,3-Trichlorobenzene	U		18	49	µg/Kg-dry	1	8/19/2020 00:02
1,2,4-Trichlorobenzene	U		17	49	µg/Kg-dry	1	8/19/2020 00:02
1,2-Dibromo-3-chloropropane	U		14	49	µg/Kg-dry	1	8/19/2020 00:02
1,2-Dibromoethane	U		4.1	15	µg/Kg-dry	1	8/19/2020 00:02
1,2-Dichlorobenzene	U		5.6	15	µg/Kg-dry	1	8/19/2020 00:02
1,2-Dichloroethane	U		22	49	µg/Kg-dry	1	8/19/2020 00:02
1,2-Dichloropropane	U		11	15	µg/Kg-dry	1	8/19/2020 00:02
1,3-Dichlorobenzene	U		4.9	15	µg/Kg-dry	1	8/19/2020 00:02
1,4-Dichlorobenzene	U		3.5	15	µg/Kg-dry	1	8/19/2020 00:02
2-Butanone	U		12	98	µg/Kg-dry	1	8/19/2020 00:02
2-Hexanone	U		7.3	15	µg/Kg-dry	1	8/19/2020 00:02
4-Methyl-2-pentanone	U		14	15	µg/Kg-dry	1	8/19/2020 00:02
Acetone	U		44	49	µg/Kg-dry	1	8/19/2020 00:02
Benzene	U		2.5	15	µg/Kg-dry	1	8/19/2020 00:02
Bromochloromethane	U		7.5	15	µg/Kg-dry	1	8/19/2020 00:02
Bromodichloromethane	U		8.2	15	µg/Kg-dry	1	8/19/2020 00:02
Bromoform	U		6.2	15	µg/Kg-dry	1	8/19/2020 00:02
Bromomethane	U		28	49	µg/Kg-dry	1	8/19/2020 00:02
Carbon disulfide	U		7.6	15	µg/Kg-dry	1	8/19/2020 00:02
Carbon tetrachloride	U		5.7	15	µg/Kg-dry	1	8/19/2020 00:02
Chlorobenzene	U		4.9	15	µg/Kg-dry	1	8/19/2020 00:02
Chloroethane	U		14	49	µg/Kg-dry	1	8/19/2020 00:02
Chloroform	U		5.4	15	µg/Kg-dry	1	8/19/2020 00:02
Chloromethane	U		40	49	µg/Kg-dry	1	8/19/2020 00:02
cis-1,2-Dichloroethene	U		4.6	15	µg/Kg-dry	1	8/19/2020 00:02

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-5 (4'-6') Grab
Collection Date: 8/11/2020 11:00 AM

Work Order: 20080750
Lab ID: 20080750-05
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		11	15	µg/Kg-dry	1	8/19/2020 00:02
Cyclohexane	U		4.8	49	µg/Kg-dry	1	8/19/2020 00:02
Dibromochloromethane	U		8.3	15	µg/Kg-dry	1	8/19/2020 00:02
Dichlorodifluoromethane	U		18	49	µg/Kg-dry	1	8/19/2020 00:02
Ethylbenzene	U		3.1	15	µg/Kg-dry	1	8/19/2020 00:02
Isopropylbenzene	U		4.5	15	µg/Kg-dry	1	8/19/2020 00:02
m,p-Xylene	U		20	29	µg/Kg-dry	1	8/19/2020 00:02
Methyl acetate	U		18	120	µg/Kg-dry	1	8/19/2020 00:02
Methyl tert-butyl ether	U		4.2	15	µg/Kg-dry	1	8/19/2020 00:02
Methylcyclohexane	U		5.6	15	µg/Kg-dry	1	8/19/2020 00:02
Methylene chloride	U		39	120	µg/Kg-dry	1	8/19/2020 00:02
o-Xylene	U		5.7	15	µg/Kg-dry	1	8/19/2020 00:02
Styrene	U		5.8	15	µg/Kg-dry	1	8/19/2020 00:02
Tetrachloroethene	U		4.3	15	µg/Kg-dry	1	8/19/2020 00:02
Toluene	U		4.0	15	µg/Kg-dry	1	8/19/2020 00:02
trans-1,2-Dichloroethene	U		5.4	15	µg/Kg-dry	1	8/19/2020 00:02
trans-1,3-Dichloropropene	U		8.2	15	µg/Kg-dry	1	8/19/2020 00:02
Trichloroethene	U		6.6	15	µg/Kg-dry	1	8/19/2020 00:02
Trichlorofluoromethane	U		7.5	15	µg/Kg-dry	1	8/19/2020 00:02
Vinyl chloride	U		9.8	15	µg/Kg-dry	1	8/19/2020 00:02
1,2-Dichloroethene, Total	U		5.4	29	µg/Kg-dry	1	8/19/2020 00:02
1,3-Dichloropropene, Total	U		11	29	µg/Kg-dry	1	8/19/2020 00:02
Xylenes, Total	U		20	44	µg/Kg-dry	1	8/19/2020 00:02
Surr: 1,2-Dichloroethane-d4	*104*			*70-130*	*%REC*	1	8/19/2020 00:02
Surr: 4-Bromofluorobenzene	*104*			*70-130*	*%REC*	1	8/19/2020 00:02
Surr: Dibromofluoromethane	*99.0*			*70-130*	*%REC*	1	8/19/2020 00:02
Surr: Toluene-d8	*99.4*			*70-130*	*%REC*	1	8/19/2020 00:02
MOISTURE		Method:**SW3550C**					Analyst: **KTP**
Moisture	**18**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-6 (8'-10') Grab
Collection Date: 8/11/2020 10:00 AM

Work Order: 20080750
Lab ID: 20080750-06
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**5.3**	J	**3.4**	**12**	**mg/Kg-dry**	1	8/19/2020 00:27
Surr: 4-Terphenyl-d14	*93.4*			*33-111*	*%REC*	1	8/19/2020 00:27
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		1,800	4,200	µg/Kg-dry	1	8/14/2020 19:20
Surr: Toluene-d8	*91.0*			*71-123*	*%REC*	1	8/14/2020 19:20
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		5.7	13	µg/Kg-dry	1	8/19/2020 00:18
1,1,2,2-Tetrachloroethane	U		5.5	13	µg/Kg-dry	1	8/19/2020 00:18
1,1,2-Trichloroethane	U		5.3	13	µg/Kg-dry	1	8/19/2020 00:18
1,1,2-Trichlorotrifluoroethane	U		8.0	13	µg/Kg-dry	1	8/19/2020 00:18
1,1-Dichloroethane	U		4.6	13	µg/Kg-dry	1	8/19/2020 00:18
1,1-Dichloroethene	U		4.1	13	µg/Kg-dry	1	8/19/2020 00:18
1,2,3-Trichlorobenzene	U		15	42	µg/Kg-dry	1	8/19/2020 00:18
1,2,4-Trichlorobenzene	U		14	42	µg/Kg-dry	1	8/19/2020 00:18
1,2-Dibromo-3-chloropropane	U		12	42	µg/Kg-dry	1	8/19/2020 00:18
1,2-Dibromoethane	U		3.5	13	µg/Kg-dry	1	8/19/2020 00:18
1,2-Dichlorobenzene	U		4.8	13	µg/Kg-dry	1	8/19/2020 00:18
1,2-Dichloroethane	U		19	42	µg/Kg-dry	1	8/19/2020 00:18
1,2-Dichloropropane	U		9.3	13	µg/Kg-dry	1	8/19/2020 00:18
1,3-Dichlorobenzene	U		4.2	13	µg/Kg-dry	1	8/19/2020 00:18
1,4-Dichlorobenzene	U		3.0	13	µg/Kg-dry	1	8/19/2020 00:18
2-Butanone	U		10	84	µg/Kg-dry	1	8/19/2020 00:18
2-Hexanone	U		6.2	13	µg/Kg-dry	1	8/19/2020 00:18
4-Methyl-2-pentanone	U		12	13	µg/Kg-dry	1	8/19/2020 00:18
Acetone	U		37	42	µg/Kg-dry	1	8/19/2020 00:18
Benzene	U		2.1	13	µg/Kg-dry	1	8/19/2020 00:18
Bromochloromethane	U		6.4	13	µg/Kg-dry	1	8/19/2020 00:18
Bromodichloromethane	U		7.0	13	µg/Kg-dry	1	8/19/2020 00:18
Bromoform	U		5.3	13	µg/Kg-dry	1	8/19/2020 00:18
Bromomethane	U		24	42	µg/Kg-dry	1	8/19/2020 00:18
Carbon disulfide	U		6.5	13	µg/Kg-dry	1	8/19/2020 00:18
Carbon tetrachloride	U		4.9	13	µg/Kg-dry	1	8/19/2020 00:18
Chlorobenzene	U		4.2	13	µg/Kg-dry	1	8/19/2020 00:18
Chloroethane	U		12	42	µg/Kg-dry	1	8/19/2020 00:18
Chloroform	U		4.6	13	µg/Kg-dry	1	8/19/2020 00:18
Chloromethane	U		34	42	µg/Kg-dry	1	8/19/2020 00:18
cis-1,2-Dichloroethene	U		3.9	13	µg/Kg-dry	1	8/19/2020 00:18

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-6 (8'-10') Grab
Collection Date: 8/11/2020 10:00 AM

Work Order: 20080750
Lab ID: 20080750-06
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		9.5	13	µg/Kg-dry	1	8/19/2020 00:18
Cyclohexane	U		4.1	42	µg/Kg-dry	1	8/19/2020 00:18
Dibromochloromethane	U		7.1	13	µg/Kg-dry	1	8/19/2020 00:18
Dichlorodifluoromethane	U		15	42	µg/Kg-dry	1	8/19/2020 00:18
Ethylbenzene	U		2.7	13	µg/Kg-dry	1	8/19/2020 00:18
Isopropylbenzene	U		3.8	13	µg/Kg-dry	1	8/19/2020 00:18
m,p-Xylene	U		17	25	µg/Kg-dry	1	8/19/2020 00:18
Methyl acetate	U		15	100	µg/Kg-dry	1	8/19/2020 00:18
Methyl tert-butyl ether	U		3.6	13	µg/Kg-dry	1	8/19/2020 00:18
Methylcyclohexane	U		4.8	13	µg/Kg-dry	1	8/19/2020 00:18
Methylene chloride	U		33	100	µg/Kg-dry	1	8/19/2020 00:18
o-Xylene	U		4.9	13	µg/Kg-dry	1	8/19/2020 00:18
Styrene	U		5.0	13	µg/Kg-dry	1	8/19/2020 00:18
Tetrachloroethene	U		3.7	13	µg/Kg-dry	1	8/19/2020 00:18
Toluene	U		3.4	13	µg/Kg-dry	1	8/19/2020 00:18
trans-1,2-Dichloroethene	U		4.6	13	µg/Kg-dry	1	8/19/2020 00:18
trans-1,3-Dichloropropene	U		7.0	13	µg/Kg-dry	1	8/19/2020 00:18
Trichloroethene	U		5.6	13	µg/Kg-dry	1	8/19/2020 00:18
Trichlorofluoromethane	U		6.4	13	µg/Kg-dry	1	8/19/2020 00:18
Vinyl chloride	U		8.4	13	µg/Kg-dry	1	8/19/2020 00:18
1,2-Dichloroethene, Total	U		4.6	25	µg/Kg-dry	1	8/19/2020 00:18
1,3-Dichloropropene, Total	U		9.5	25	µg/Kg-dry	1	8/19/2020 00:18
Xylenes, Total	U		17	38	µg/Kg-dry	1	8/19/2020 00:18
Surr: 1,2-Dichloroethane-d4	*104*			*70-130*	*%REC*	1	8/19/2020 00:18
Surr: 4-Bromofluorobenzene	*101*			*70-130*	*%REC*	1	8/19/2020 00:18
Surr: Dibromofluoromethane	*101*			*70-130*	*%REC*	1	8/19/2020 00:18
Surr: Toluene-d8	*99.3*			*70-130*	*%REC*	1	8/19/2020 00:18
MOISTURE		Method:**SW3550C**					Analyst: **KTP**
Moisture	**18**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: SP-7 (18'-20') Grab
Collection Date: 8/11/2020 10:30 AM

Work Order: 20080750
Lab ID: 20080750-07
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
DIESEL RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW3550 / 8/18/20		Analyst: **JZB**
DRO (C10-C28)	**4.9**	J	**3.5**	**12**	**mg/Kg-dry**	1	8/19/2020 01:06
Surr: 4-Terphenyl-d14	*81.3*			*33-111*	*%REC*	1	8/19/2020 01:06
GASOLINE RANGE ORGANICS BY GC-FID		Method:**SW8015D**			Prep: SW5035 / 8/13/20		Analyst: **JZB**
GRO (C6-C10)	U		1,600	3,700	µg/Kg-dry	1	8/14/2020 18:12
Surr: Toluene-d8	*94.2*			*71-123*	*%REC*	1	8/14/2020 18:12
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**			Prep: SW5035 / 8/13/20		Analyst: **MF**
1,1,1-Trichloroethane	U		5.1	11	µg/Kg-dry	1	8/19/2020 00:34
1,1,2,2-Tetrachloroethane	U		5.0	11	µg/Kg-dry	1	8/19/2020 00:34
1,1,2-Trichloroethane	U		4.8	11	µg/Kg-dry	1	8/19/2020 00:34
1,1,2-Trichlorotrifluoroethane	U		7.1	11	µg/Kg-dry	1	8/19/2020 00:34
1,1-Dichloroethane	U		4.1	11	µg/Kg-dry	1	8/19/2020 00:34
1,1-Dichloroethene	U		3.6	11	µg/Kg-dry	1	8/19/2020 00:34
1,2,3-Trichlorobenzene	U		13	37	µg/Kg-dry	1	8/19/2020 00:34
1,2,4-Trichlorobenzene	U		13	37	µg/Kg-dry	1	8/19/2020 00:34
1,2-Dibromo-3-chloropropane	U		10	37	µg/Kg-dry	1	8/19/2020 00:34
1,2-Dibromoethane	U		3.2	11	µg/Kg-dry	1	8/19/2020 00:34
1,2-Dichlorobenzene	U		4.3	11	µg/Kg-dry	1	8/19/2020 00:34
1,2-Dichloroethane	U		17	37	µg/Kg-dry	1	8/19/2020 00:34
1,2-Dichloropropane	U		8.3	11	µg/Kg-dry	1	8/19/2020 00:34
1,3-Dichlorobenzene	U		3.7	11	µg/Kg-dry	1	8/19/2020 00:34
1,4-Dichlorobenzene	U		2.7	11	µg/Kg-dry	1	8/19/2020 00:34
2-Butanone	U		9.2	75	µg/Kg-dry	1	8/19/2020 00:34
2-Hexanone	U		5.6	11	µg/Kg-dry	1	8/19/2020 00:34
4-Methyl-2-pentanone	U		10	11	µg/Kg-dry	1	8/19/2020 00:34
Acetone	U		33	37	µg/Kg-dry	1	8/19/2020 00:34
Benzene	U		1.9	11	µg/Kg-dry	1	8/19/2020 00:34
Bromochloromethane	U		5.7	11	µg/Kg-dry	1	8/19/2020 00:34
Bromodichloromethane	U		6.3	11	µg/Kg-dry	1	8/19/2020 00:34
Bromoform	U		4.7	11	µg/Kg-dry	1	8/19/2020 00:34
Bromomethane	U		21	37	µg/Kg-dry	1	8/19/2020 00:34
Carbon disulfide	U		5.8	11	µg/Kg-dry	1	8/19/2020 00:34
Carbon tetrachloride	U		4.4	11	µg/Kg-dry	1	8/19/2020 00:34
Chlorobenzene	U		3.7	11	µg/Kg-dry	1	8/19/2020 00:34
Chloroethane	U		11	37	µg/Kg-dry	1	8/19/2020 00:34
Chloroform	U		4.1	11	µg/Kg-dry	1	8/19/2020 00:34
Chloromethane	U		31	37	µg/Kg-dry	1	8/19/2020 00:34
cis-1,2-Dichloroethene	U		3.5	11	µg/Kg-dry	1	8/19/2020 00:34

Note: See Qualifiers page for a list of qualifiers and their definitions.

Client: Terracon
Project: N2207019
Sample ID: SP-7 (18'-20') Grab
Collection Date: 8/11/2020 10:30 AM

Work Order: 20080750
Lab ID: 20080750-07
Matrix: SOIL

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
cis-1,3-Dichloropropene	U		8.5	11	µg/Kg-dry	1	8/19/2020 00:34
Cyclohexane	U		3.7	37	µg/Kg-dry	1	8/19/2020 00:34
Dibromochloromethane	U		6.3	11	µg/Kg-dry	1	8/19/2020 00:34
Dichlorodifluoromethane	U		14	37	µg/Kg-dry	1	8/19/2020 00:34
Ethylbenzene	U		2.4	11	µg/Kg-dry	1	8/19/2020 00:34
Isopropylbenzene	U		3.4	11	µg/Kg-dry	1	8/19/2020 00:34
m,p-Xylene	U		15	22	µg/Kg-dry	1	8/19/2020 00:34
Methyl acetate	U		13	93	µg/Kg-dry	1	8/19/2020 00:34
Methyl tert-butyl ether	U		3.2	11	µg/Kg-dry	1	8/19/2020 00:34
Methylcyclohexane	U		4.3	11	µg/Kg-dry	1	8/19/2020 00:34
Methylene chloride	U		30	93	µg/Kg-dry	1	8/19/2020 00:34
o-Xylene	U		4.3	11	µg/Kg-dry	1	8/19/2020 00:34
Styrene	U		4.4	11	µg/Kg-dry	1	8/19/2020 00:34
Tetrachloroethene	U		3.3	11	µg/Kg-dry	1	8/19/2020 00:34
Toluene	U		3.1	11	µg/Kg-dry	1	8/19/2020 00:34
trans-1,2-Dichloroethene	U		4.1	11	µg/Kg-dry	1	8/19/2020 00:34
trans-1,3-Dichloropropene	U		6.3	11	µg/Kg-dry	1	8/19/2020 00:34
Trichloroethene	U		5.0	11	µg/Kg-dry	1	8/19/2020 00:34
Trichlorofluoromethane	U		5.7	11	µg/Kg-dry	1	8/19/2020 00:34
Vinyl chloride	U		7.5	11	µg/Kg-dry	1	8/19/2020 00:34
1,2-Dichloroethene, Total	U		4.1	22	µg/Kg-dry	1	8/19/2020 00:34
1,3-Dichloropropene, Total	U		8.5	22	µg/Kg-dry	1	8/19/2020 00:34
Xylenes, Total	U		15	34	µg/Kg-dry	1	8/19/2020 00:34
Surr: 1,2-Dichloroethane-d4	*100*			*70-130*	*%REC*	1	8/19/2020 00:34
Surr: 4-Bromofluorobenzene	*103*			*70-130*	*%REC*	1	8/19/2020 00:34
Surr: Dibromofluoromethane	*96.9*			*70-130*	*%REC*	1	8/19/2020 00:34
Surr: Toluene-d8	*99.3*			*70-130*	*%REC*	1	8/19/2020 00:34
MOISTURE		Method:**SW3550C**					Analyst: **KTP**
Moisture	**20**		**0.10**	**0.10**	**% of sample**	1	8/20/2020 10:13

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: Trip Blank Grab
Collection Date: 8/11/2020 09:30 AM

Work Order: 20080750
Lab ID: 20080750-08
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Method:**SW8260C**					Analyst: **MF**
1,1,1-Trichloroethane	U		0.46	1.0	µg/L	1	8/18/2020 22:08
1,1,2,2-Tetrachloroethane	U		0.40	1.0	µg/L	1	8/18/2020 22:08
1,1,2-Trichloroethane	U		0.46	1.0	µg/L	1	8/18/2020 22:08
1,1,2-Trichlorotrifluoroethane	U		0.52	1.0	µg/L	1	8/18/2020 22:08
1,1-Dichloroethane	U		0.44	1.0	µg/L	1	8/18/2020 22:08
1,1-Dichloroethene	U		0.40	1.0	µg/L	1	8/18/2020 22:08
1,2,3-Trichlorobenzene	U		0.42	1.0	µg/L	1	8/18/2020 22:08
1,2,4-Trichlorobenzene	U		0.45	1.0	µg/L	1	8/18/2020 22:08
1,2-Dibromo-3-chloropropane	U		0.43	1.0	µg/L	1	8/18/2020 22:08
1,2-Dibromoethane	U		0.41	1.0	µg/L	1	8/18/2020 22:08
1,2-Dichlorobenzene	U		0.32	1.0	µg/L	1	8/18/2020 22:08
1,2-Dichloroethane	U		0.44	1.0	µg/L	1	8/18/2020 22:08
1,2-Dichloropropane	U		0.48	1.0	µg/L	1	8/18/2020 22:08
1,3-Dichlorobenzene	U		0.33	1.0	µg/L	1	8/18/2020 22:08
1,4-Dichlorobenzene	U		0.35	1.0	µg/L	1	8/18/2020 22:08
2-Butanone	U		0.52	5.0	µg/L	1	8/18/2020 22:08
2-Hexanone	U		0.59	5.0	µg/L	1	8/18/2020 22:08
4-Methyl-2-pentanone	U		0.52	1.0	µg/L	1	8/18/2020 22:08
Acetone	U		6.2	10	µg/L	1	8/18/2020 22:08
Benzene	U		0.46	1.0	µg/L	1	8/18/2020 22:08
Bromochloromethane	U		0.45	1.0	µg/L	1	8/18/2020 22:08
Bromodichloromethane	U		0.49	1.0	µg/L	1	8/18/2020 22:08
Bromoform	U		0.56	1.0	µg/L	1	8/18/2020 22:08
Bromomethane	U		0.90	1.0	µg/L	1	8/18/2020 22:08
Carbon disulfide	U		0.49	1.0	µg/L	1	8/18/2020 22:08
Carbon tetrachloride	U		0.40	1.0	µg/L	1	8/18/2020 22:08
Chlorobenzene	U		0.40	1.0	µg/L	1	8/18/2020 22:08
Chloroethane	U		0.68	1.0	µg/L	1	8/18/2020 22:08
Chloroform	U		0.46	1.0	µg/L	1	8/18/2020 22:08
Chloromethane	**5.6**		**0.83**	**1.0**	**µg/L**	1	8/18/2020 22:08
cis-1,2-Dichloroethene	U		0.42	1.0	µg/L	1	8/18/2020 22:08
cis-1,3-Dichloropropene	U		0.57	1.0	µg/L	1	8/18/2020 22:08
Cyclohexane	U		0.63	2.0	µg/L	1	8/18/2020 22:08
Dibromochloromethane	U		0.40	1.0	µg/L	1	8/18/2020 22:08
Dichlorodifluoromethane	U		0.68	1.0	µg/L	1	8/18/2020 22:08
Ethylbenzene	U		0.34	1.0	µg/L	1	8/18/2020 22:08
Isopropylbenzene	U		0.35	1.0	µg/L	1	8/18/2020 22:08
m,p-Xylene	U		0.81	2.0	µg/L	1	8/18/2020 22:08

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *25-Aug-20*

Client: Terracon
Project: N2207019
Sample ID: Trip Blank Grab
Collection Date: 8/11/2020 09:30 AM

Work Order: 20080750
Lab ID: 20080750-08
Matrix: WATER

Analyses	Result	Qual	MDL	Report Limit	Units	Dilution Factor	Date Analyzed
Methyl acetate	U		0.59	2.0	µg/L	1	8/18/2020 22:08
Methyl tert-butyl ether	U		0.45	1.0	µg/L	1	8/18/2020 22:08
Methylcyclohexane	U		0.35	1.0	µg/L	1	8/18/2020 22:08
Methylene chloride	U		0.86	5.0	µg/L	1	8/18/2020 22:08
o-Xylene	U		0.31	1.0	µg/L	1	8/18/2020 22:08
Styrene	U		0.33	1.0	µg/L	1	8/18/2020 22:08
Tetrachloroethene	U		0.39	1.0	µg/L	1	8/18/2020 22:08
Toluene	U		0.45	1.0	µg/L	1	8/18/2020 22:08
trans-1,2-Dichloroethene	U		0.48	1.0	µg/L	1	8/18/2020 22:08
trans-1,3-Dichloropropene	U		0.38	1.0	µg/L	1	8/18/2020 22:08
Trichloroethene	U		0.43	1.0	µg/L	1	8/18/2020 22:08
Trichlorofluoromethane	U		0.52	1.0	µg/L	1	8/18/2020 22:08
Vinyl chloride	U		0.53	1.0	µg/L	1	8/18/2020 22:08
1,2-Dichloroethene, Total	U		0.48	2.0	µg/L	1	8/18/2020 22:08
1,3-Dichloropropene, Total	U		0.57	2.0	µg/L	1	8/18/2020 22:08
Xylenes, Total	U		0.81	3.0	µg/L	1	8/18/2020 22:08
Surr: 1,2-Dichloroethane-d4	*104*			*75-120*	*%REC*	1	8/18/2020 22:08
Surr: 4-Bromofluorobenzene	*96.2*			*80-110*	*%REC*	1	8/18/2020 22:08
Surr: Dibromofluoromethane	*102*			*85-115*	*%REC*	1	8/18/2020 22:08
Surr: Toluene-d8	*101*			*85-110*	*%REC*	1	8/18/2020 22:08

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 25-Aug-20

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **162758** Instrument ID: **GC8** Method: **SW8015D**

MBLK Sample ID: **DBLKS1-162758-162758** Units: **mg/Kg** Analysis Date: **8/18/2020 05:17 PM**
Client ID: Run ID: **GC8_200818A** SeqNo: **6644642** Prep Date: **8/18/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
DRO (C10-C28)	4.962	2.8	10								J
Surr: 4-Terphenyl-d14	*2.867*	0	0	*3.33*	0	*86.1*	*33-111*	0			

LCS Sample ID: **DLCSS1-162758-162758** Units: **mg/Kg** Analysis Date: **8/18/2020 05:57 PM**
Client ID: Run ID: **GC8_200818A** SeqNo: **6644643** Prep Date: **8/18/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
DRO (C10-C28)	345.2	2.8	10	333	0	104	80-121	0			
Surr: 4-Terphenyl-d14	*2.813*	0	0	*3.33*	0	*84.5*	*33-111*	0			

MS Sample ID: **20081254-01A MS** Units: **mg/Kg** Analysis Date: **8/18/2020 06:36 PM**
Client ID: Run ID: **GC8_200818A** SeqNo: **6644644** Prep Date: **8/18/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
DRO (C10-C28)	345.6	2.8	9.7	322.7	7.302	105	80-121	0			
Surr: 4-Terphenyl-d14	*2.912*	0	0	*3.227*	0	*90.3*	*33-111*	0			

MSD Sample ID: **20081254-01A MSD** Units: **mg/Kg** Analysis Date: **8/18/2020 08:33 PM**
Client ID: Run ID: **GC8_200818A** SeqNo: **6644647** Prep Date: **8/18/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
DRO (C10-C28)	339.9	2.8	9.8	326.4	7.302	102	80-121	345.6	1.69	30	
Surr: 4-Terphenyl-d14	*2.791*	0	0	*3.264*	0	*85.5*	*33-111*	2.912	*4.24*	*30*	

The following samples were analyzed in this batch:

20080750-01A	20080750-02A	20080750-03A
20080750-04A	20080750-05A	20080750-06A
20080750-07A		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **162570** Instrument ID: **GC9** Method: **SW8015D**

MBLK Sample ID: **MBLK-162570-162570** Units: **µg/Kg-dry** Analysis Date: **8/14/2020 10:34 AM**
Client ID: Run ID: **GC9_200814A** SeqNo: **6637108** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
GRO (C6-C10)	U	2100	5,000	0	0	0		0			
Surr: Toluene-d8	*4604*	0	0	*5000*	0	*92.1*	*71-123*	0			

LCS Sample ID: **LCS-162570-162570** Units: **µg/Kg-dry** Analysis Date: **8/14/2020 09:26 AM**
Client ID: Run ID: **GC9_200814A** SeqNo: **6637124** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
GRO (C6-C10)	215000	2100	5,000	250000	0	86	71-123	0			
Surr: Toluene-d8	*4218*	0	0	*5000*	0	*84.4*	*71-123*	0			

MS Sample ID: **20080944-05A MS** Units: **µg/Kg-dry** Analysis Date: **8/14/2020 01:14 PM**
Client ID: Run ID: **GC9_200814A** SeqNo: **6637115** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
GRO (C6-C10)	399900	3200	7,600	380800	71510	86.2	71-123	0			
Surr: Toluene-d8	*6722*	0	0	*7616*	0	*88.3*	*71-123*	0			

MSD Sample ID: **20080944-05A MSD** Units: **µg/Kg-dry** Analysis Date: **8/14/2020 01:37 PM**
Client ID: Run ID: **GC9_200814A** SeqNo: **6637116** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
GRO (C6-C10)	405000	3200	7,700	382600	71510	87.2	71-123	399900	1.27	30	
Surr: Toluene-d8	*6695*	0	0	*7652*	0	*87.5*	*71-123*	6722	*0.39*	*30*	

The following samples were analyzed in this batch:

20080750-01B	20080750-02B	20080750-03B
20080750-04B	20080750-05B	20080750-06B
20080750-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MBLK Sample ID: **MBLK-161553-161553** Units: **µg/Kg-dry** Analysis Date: **8/14/2020 10:30 PM**

Client ID: Run ID: **VMS7_200814A** SeqNo: **6639613** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	U	14	30								
1,1,2,2-Tetrachloroethane	U	13	30								
1,1,2-Trichloroethane	U	13	30								
1,1,2-Trichlorotrifluoroethane	U	19	30								
1,1-Dichloroethane	U	11	30								
1,1-Dichloroethene	U	9.7	30								
1,2,3-Trichlorobenzene	U	36	100								
1,2,4-Trichlorobenzene	U	34	100								
1,2-Dibromo-3-chloropropane	U	28	100								
1,2-Dibromoethane	U	8.4	30								
1,2-Dichlorobenzene	U	11	30								
1,2-Dichloroethane	U	45	100								
1,2-Dichloropropane	U	22	30								
1,3-Dichlorobenzene	U	10	30								
1,4-Dichlorobenzene	U	7.2	30								
2-Butanone	U	25	200								
2-Hexanone	15.5	15	30								J
4-Methyl-2-pentanone	U	28	30								
Acetone	U	89	100								
Benzene	U	5.1	30								
Bromochloromethane	U	15	30								
Bromodichloromethane	U	17	30								
Bromoform	U	13	30								
Bromomethane	69	57	100								J
Carbon disulfide	U	16	30								
Carbon tetrachloride	U	12	30								
Chlorobenzene	U	10	30								
Chloroethane	U	30	100								
Chloroform	U	11	30								
Chloromethane	U	82	100								
cis-1,2-Dichloroethene	U	9.4	30								
cis-1,3-Dichloropropene	U	23	30								
Cyclohexane	U	9.8	100								
Dibromochloromethane	U	17	30								
Dichlorodifluoromethane	U	36	100								
Ethylbenzene	U	6.3	30								
Isopropylbenzene	U	9.2	30								
m,p-Xylene	U	40	60								
Methyl acetate	U	36	250								
Methyl tert-butyl ether	U	8.6	30								
Methylcyclohexane	U	11	30								
Methylene chloride	U	80	250								
o-Xylene	U	12	30								

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

Styrene	U	12	30					
Tetrachloroethene	U	8.7	30					
Toluene	U	8.2	30					
trans-1,2-Dichloroethene	U	11	30					
trans-1,3-Dichloropropene	U	17	30					
Trichloroethene	U	13	30					
Trichlorofluoromethane	U	15	30					
Vinyl chloride	U	20	30					
1,2-Dichloroethene, Total	U	11	60					
1,3-Dichloropropene, Total	U	23	60					
Xylenes, Total	U	40	90					
Surr: 1,2-Dichloroethane-d4	*1062*	0	0	*1000*	0	*106*	*70-130*	0
Surr: 4-Bromofluorobenzene	*1058*	0	0	*1000*	0	*106*	*70-130*	0
Surr: Dibromofluoromethane	*998*	0	0	*1000*	0	*99.8*	*70-130*	0
Surr: Toluene-d8	*1011*	0	0	*1000*	0	*101*	*70-130*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MBLK Sample ID: **MBLK-161553-161553** Units: **µg/Kg-dry** Analysis Date: **8/18/2020 01:35 AM**

Client ID: Run ID: **VMS6_200817B** SeqNo: **6642226** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	U	14	30	0	0	0	0-0	0			
1,1,2,2-Tetrachloroethane	U	13	30	0	0	0	0-0	0			
1,1,2-Trichloroethane	U	13	30	0	0	0	0-0	0			
1,1,2-Trichlorotrifluoroethane	U	19	30	0	0	0		0			
1,1-Dichloroethane	U	11	30	0	0	0	0-0	0			
1,1-Dichloroethene	U	9.7	30	0	0	0	0-0	0			
1,2,3-Trichlorobenzene	U	36	100	0	0	0	0-0	0			
1,2,4-Trichlorobenzene	U	34	100	0	0	0	0-0	0			
1,2-Dibromo-3-chloropropane	U	28	100	0	0	0	0-0	0			
1,2-Dibromoethane	U	8.4	30	0	0	0	0-0	0			
1,2-Dichlorobenzene	U	11	30	0	0	0	0-0	0			
1,2-Dichloroethane	U	45	100	0	0	0	0-0	0			
1,2-Dichloropropane	U	22	30	0	0	0	0-0	0			
1,3-Dichlorobenzene	U	10	30	0	0	0	0-0	0			
1,4-Dichlorobenzene	U	7.2	30	0	0	0	0-0	0			
2-Butanone	U	25	200	0	0	0	0-0	0			
2-Hexanone	U	15	30	0	0	0	0-0	0			
4-Methyl-2-pentanone	U	28	30	0	0	0	0-0	0			
Acetone	U	89	100	0	0	0	0-0	0			
Benzene	U	5.1	30	0	0	0	0-0	0			
Bromochloromethane	U	15	30	0	0	0	0-0	0			
Bromodichloromethane	U	17	30	0	0	0	0-0	0			
Bromoform	U	13	30	0	0	0	0-0	0			
Bromomethane	U	57	100	0	0	0	0-0	0			
Carbon disulfide	U	16	30	0	0	0	0-0	0			
Carbon tetrachloride	U	12	30	0	0	0	0-0	0			
Chlorobenzene	U	10	30	0	0	0	0-0	0			
Chloroethane	U	30	100	0	0	0	0-0	0			
Chloroform	U	11	30	0	0	0	0-0	0			
Chloromethane	U	82	100	0	0	0	0-0	0			
cis-1,2-Dichloroethene	U	9.4	30	0	0	0	0-0	0			
cis-1,3-Dichloropropene	U	23	30	0	0	0	0-0	0			
Cyclohexane	U	9.8	100	0	0	0		0			
Dibromochloromethane	U	17	30	0	0	0	0-0	0			
Dichlorodifluoromethane	U	36	100	0	0	0	0-0	0			
Ethylbenzene	U	6.3	30	0	0	0	0-0	0			
Isopropylbenzene	U	9.2	30	0	0	0	0-0	0			
m,p-Xylene	U	40	60	0	0	0	0-0	0			
Methyl acetate	U	36	250	0	0	0		0			
Methyl tert-butyl ether	U	8.6	30	0	0	0	0-0	0			
Methylcyclohexane	U	11	30	0	0	0		0			
Methylene chloride	U	80	250	0	0	0	0-0	0			
o-Xylene	U	12	30	0	0	0	0-0	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID:**VMS7** Method: **SW8260C**

Styrene	U	12	30	0	0	0	0-0	0
Tetrachloroethene	U	8.7	30	0	0	0	0-0	0
Toluene	U	8.2	30	0	0	0	0-0	0
trans-1,2-Dichloroethene	U	11	30	0	0	0	0-0	0
trans-1,3-Dichloropropene	U	17	30	0	0	0	0-0	0
Trichloroethene	U	13	30	0	0	0	0-0	0
Trichlorofluoromethane	U	15	30	0	0	0	0-0	0
Vinyl chloride	U	20	30	0	0	0	0-0	0
1,2-Dichloroethene, Total	U	11	60	0	0	0	0-0	0
1,3-Dichloropropene, Total	U	23	60	0	0	0	0-0	0
Xylenes, Total	U	40	90	0	0	0	0-0	0
Surr: 1,2-Dichloroethane-d4	*1002*	0	0	*1000*	0	*100*	*70-130*	0
Surr: 4-Bromofluorobenzene	*1004*	0	0	*1000*	0	*100*	*70-130*	0
Surr: Dibromofluoromethane	*1045*	0	0	*1000*	0	*104*	*70-130*	0
Surr: Toluene-d8	*980*	0	0	*1000*	0	*98*	*70-130*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MBLK Sample ID: **MBLK-161553-161553** Units: **µg/Kg-dry** Analysis Date: **8/18/2020 09:52 PM**

Client ID: Run ID: **VMS8_200818B** SeqNo: **6644933** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	U	14	30								
1,1,2,2-Tetrachloroethane	U	13	30								
1,1,2-Trichloroethane	U	13	30								
1,1,2-Trichlorotrifluoroethane	U	19	30								
1,1-Dichloroethane	U	11	30								
1,1-Dichloroethene	U	9.7	30								
1,2,3-Trichlorobenzene	U	36	100								
1,2,4-Trichlorobenzene	U	34	100								
1,2-Dibromo-3-chloropropane	U	28	100								
1,2-Dibromoethane	U	8.4	30								
1,2-Dichlorobenzene	U	11	30								
1,2-Dichloroethane	U	45	100								
1,2-Dichloropropane	U	22	30								
1,3-Dichlorobenzene	U	10	30								
1,4-Dichlorobenzene	U	7.2	30								
2-Butanone	U	25	200								
2-Hexanone	U	15	30								
4-Methyl-2-pentanone	U	28	30								
Acetone	U	89	100								
Benzene	U	5.1	30								
Bromochloromethane	U	15	30								
Bromodichloromethane	U	17	30								
Bromoform	U	13	30								
Bromomethane	U	57	100								
Carbon disulfide	U	16	30								
Carbon tetrachloride	U	12	30								
Chlorobenzene	U	10	30								
Chloroethane	U	30	100								
Chloroform	U	11	30								
Chloromethane	U	82	100								
cis-1,2-Dichloroethene	U	9.4	30								
cis-1,3-Dichloropropene	U	23	30								
Cyclohexane	U	9.8	100								
Dibromochloromethane	U	17	30								
Dichlorodifluoromethane	U	36	100								
Ethylbenzene	U	6.3	30								
Isopropylbenzene	U	9.2	30								
m,p-Xylene	U	40	60								
Methyl acetate	U	36	250								
Methyl tert-butyl ether	U	8.6	30								
Methylcyclohexane	U	11	30								
Methylene chloride	U	80	250								
o-Xylene	U	12	30								

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

Styrene	U	12	30					
Tetrachloroethene	U	8.7	30					
Toluene	U	8.2	30					
trans-1,2-Dichloroethene	U	11	30					
trans-1,3-Dichloropropene	U	17	30					
Trichloroethene	U	13	30					
Trichlorofluoromethane	U	15	30					
Vinyl chloride	U	20	30					
1,2-Dichloroethene, Total	U	11	60					
1,3-Dichloropropene, Total	U	23	60					
Xylenes, Total	U	40	90					
Surr: 1,2-Dichloroethane-d4	*1070*	0	0	*1000*	0	*107*	*70-130*	0
Surr: 4-Bromofluorobenzene	*1028*	0	0	*1000*	0	*103*	*70-130*	0
Surr: Dibromofluoromethane	*900.5*	0	0	*1000*	0	*90*	*70-130*	0
Surr: Toluene-d8	*973*	0	0	*1000*	0	*97.3*	*70-130*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

LCS	Sample ID: **LCS-161553-161553**					Units: **µg/Kg-dry**			Analysis Date: **8/14/2020 09:40 PM**			
Client ID:		Run ID: **VMS7_200814A**				SeqNo: **6639612**			Prep Date: **8/13/2020**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	1010	14	30	1000	0	101	70-135	0			
1,1,2,2-Tetrachloroethane	1031	13	30	1000	0	103	55-130	0			
1,1,2-Trichloroethane	1024	13	30	1000	0	102	60-125	0			
1,1-Dichloroethane	1042	11	30	1000	0	104	75-125	0			
1,1-Dichloroethene	1039	9.7	30	1000	0	104	76-148	0			
1,2,3-Trichlorobenzene	919.5	36	100	1000	0	92	60-135	0			
1,2,4-Trichlorobenzene	919.5	34	100	1000	0	92	65-130	0			
1,2-Dibromo-3-chloropropane	922.5	28	100	1000	0	92.2	40-135	0			
1,2-Dibromoethane	955.5	8.4	30	1000	0	95.6	80-195	0			
1,2-Dichlorobenzene	969.5	11	30	1000	0	97	75-120	0			
1,2-Dichloroethane	1008	45	100	1000	0	101	70-135	0			
1,2-Dichloropropane	1015	22	30	1000	0	102	70-120	0			
1,3-Dichlorobenzene	1019	10	30	1000	0	102	70-125	0			
1,4-Dichlorobenzene	994.5	7.2	30	1000	0	99.4	70-125	0			
2-Butanone	983	25	200	1000	0	98.3	30-160	0			
2-Hexanone	967.5	15	30	1000	0	96.8	45-145	0			
4-Methyl-2-pentanone	1621	28	30	1000	0	162	74-176	0			
Acetone	976.5	89	100	1000	0	97.6	20-160	0			
Benzene	996.5	5.1	30	1000	0	99.6	75-125	0			
Bromochloromethane	1062	15	30	1000	0	106	74-134	0			
Bromodichloromethane	948.5	17	30	1000	0	94.8	70-130	0			
Bromoform	857	13	30	1000	0	85.7	55-135	0			
Bromomethane	1114	57	100	1000	0	111	50-170	0			
Carbon disulfide	977.5	16	30	1000	0	97.8	45-160	0			
Carbon tetrachloride	942.5	12	30	1000	0	94.2	65-135	0			
Chlorobenzene	985.5	10	30	1000	0	98.6	75-125	0			
Chloroethane	931	30	100	1000	0	93.1	40-155	0			
Chloroform	996.5	11	30	1000	0	99.6	66-140	0			
Chloromethane	819.5	82	100	1000	0	82	50-144	0			
cis-1,2-Dichloroethene	1029	9.4	30	1000	0	103	65-125	0			
cis-1,3-Dichloropropene	925	23	30	1000	0	92.5	70-125	0			
Dibromochloromethane	866	17	30	1000	0	86.6	65-135	0			
Dichlorodifluoromethane	820	36	100	1000	0	82	35-135	0			
Ethylbenzene	1010	6.3	30	1000	0	101	75-125	0			
Isopropylbenzene	1008	9.2	30	1000	0	101	75-130	0			
m,p-Xylene	1862	40	60	2000	0	93.1	80-125	0			
Methyl tert-butyl ether	962	8.6	30	1000	0	96.2	75-125	0			
Methylene chloride	939	80	250	1000	0	93.9	55-145	0			
o-Xylene	1011	12	30	1000	0	101	75-125	0			
Styrene	1025	12	30	1000	0	102	80-138	0			
Tetrachloroethene	1032	8.7	30	1000	0	103	67-167	0			
Toluene	983	8.2	30	1000	0	98.3	70-125	0			
trans-1,2-Dichloroethene	1049	11	30	1000	0	105	65-135	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	906	17	30	1000	0	90.6	59-129	0
Trichloroethene	1006	13	30	1000	0	101	75-125	0
Trichlorofluoromethane	645.5	15	30	1000	0	64.6	25-185	0
Vinyl chloride	909	20	30	1000	0	90.9	60-125	0
1,2-Dichloroethene, Total	2078	11	60	2000	0	104	65-135	0
1,3-Dichloropropene, Total	1831	23	60	2000	0	91.6	59-129	0
Xylenes, Total	2872	40	90	3000	0	95.8	75-125	0
Surr: 1,2-Dichloroethane-d4	*1030*	0	0	*1000*	0	*103*	*70-130*	0
Surr: 4-Bromofluorobenzene	*1022*	0	0	*1000*	0	*102*	*70-130*	0
Surr: Dibromofluoromethane	*1012*	0	0	*1000*	0	*101*	*70-130*	0
Surr: Toluene-d8	*1000*	0	0	*1000*	0	*100*	*70-130*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

LCS Sample ID: **LCS-161553-161553** Units: **µg/Kg-dry** Analysis Date: **8/18/2020 12:23 AM**
Client ID: Run ID: **VMS6_200817B** SeqNo: **6642224** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	980.5	14	30	1000	0	98	70-135	0			
1,1,2,2-Tetrachloroethane	938.5	13	30	1000	0	93.8	55-130	0			
1,1,2-Trichloroethane	950	13	30	1000	0	95	60-125	0			
1,1-Dichloroethane	1026	11	30	1000	0	103	75-125	0			
1,1-Dichloroethene	960.5	9.7	30	1000	0	96	76-148	0			
1,2,3-Trichlorobenzene	863.5	36	100	1000	0	86.4	60-135	0			
1,2,4-Trichlorobenzene	921.5	34	100	1000	0	92.2	65-130	0			
1,2-Dibromo-3-chloropropane	910.5	28	100	1000	0	91	40-135	0			
1,2-Dibromoethane	1038	8.4	30	1000	0	104	80-195	0			
1,2-Dichlorobenzene	953	11	30	1000	0	95.3	75-120	0			
1,2-Dichloroethane	982.5	45	100	1000	0	98.2	70-135	0			
1,2-Dichloropropane	935.5	22	30	1000	0	93.6	70-120	0			
1,3-Dichlorobenzene	961.5	10	30	1000	0	96.2	70-125	0			
1,4-Dichlorobenzene	961	7.2	30	1000	0	96.1	70-125	0			
2-Butanone	786	25	200	1000	0	78.6	30-160	0			
2-Hexanone	838.5	15	30	1000	0	83.8	45-145	0			
4-Methyl-2-pentanone	1086	28	30	1000	0	109	74-176	0			
Acetone	869.5	89	100	1000	0	87	20-160	0			
Benzene	969	5.1	30	1000	0	96.9	75-125	0			
Bromochloromethane	926	15	30	1000	0	92.6	74-134	0			
Bromodichloromethane	1034	17	30	1000	0	103	70-130	0			
Bromoform	1026	13	30	1000	0	103	55-135	0			
Bromomethane	1200	57	100	1000	0	120	50-170	0			
Carbon disulfide	1040	16	30	1000	0	104	45-160	0			
Carbon tetrachloride	1039	12	30	1000	0	104	65-135	0			
Chlorobenzene	967	10	30	1000	0	96.7	75-125	0			
Chloroethane	984.5	30	100	1000	0	98.4	40-155	0			
Chloroform	988	11	30	1000	0	98.8	66-140	0			
Chloromethane	976.5	82	100	1000	0	97.6	50-144	0			
cis-1,2-Dichloroethene	960.5	9.4	30	1000	0	96	65-125	0			
cis-1,3-Dichloropropene	953.5	23	30	1000	0	95.4	70-125	0			
Dibromochloromethane	923.5	17	30	1000	0	92.4	65-135	0			
Dichlorodifluoromethane	1001	36	100	1000	0	100	35-135	0			
Ethylbenzene	923.5	6.3	30	1000	0	92.4	75-125	0			
Isopropylbenzene	973.5	9.2	30	1000	0	97.4	75-130	0			
m,p-Xylene	1940	40	60	2000	0	97	80-125	0			
Methyl tert-butyl ether	912	8.6	30	1000	0	91.2	75-125	0			
Methylene chloride	786.5	80	250	1000	0	78.6	55-145	0			
o-Xylene	894	12	30	1000	0	89.4	75-125	0			
Styrene	986.5	12	30	1000	0	98.6	80-138	0			
Tetrachloroethene	1065	8.7	30	1000	0	106	67-167	0			
Toluene	949	8.2	30	1000	0	94.9	70-125	0			
trans-1,2-Dichloroethene	1016	11	30	1000	0	102	65-135	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	928	17	30	1000	0	92.8	59-129	0
Trichloroethene	905.5	13	30	1000	0	90.6	75-125	0
Trichlorofluoromethane	796	15	30	1000	0	79.6	25-185	0
Vinyl chloride	911.5	20	30	1000	0	91.2	60-125	0
1,2-Dichloroethene, Total	1976	11	60	2000	0	98.8	65-135	0
1,3-Dichloropropene, Total	1882	23	60	2000	0	94.1	59-129	0
Xylenes, Total	2834	40	90	3000	0	94.5	75-125	0
Surr: 1,2-Dichloroethane-d4	*982*	0	0	*1000*	0	*98.2*	*70-130*	0
Surr: 4-Bromofluorobenzene	*994*	0	0	*1000*	0	*99.4*	*70-130*	0
Surr: Dibromofluoromethane	*1050*	0	0	*1000*	0	*105*	*70-130*	0
Surr: Toluene-d8	*972.5*	0	0	*1000*	0	*97.2*	*70-130*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

LCS	Sample ID: **LCS-161553-161553**				Units: **µg/Kg-dry**			Analysis Date: **8/18/2020 08:47 PM**			
Client ID:		Run ID: **VMS8_200818B**			SeqNo: **6644931**			Prep Date: **8/13/2020**		DF: **1**	
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	1068	14	30	1000	0	107	70-135	0			
1,1,2,2-Tetrachloroethane	1034	13	30	1000	0	103	55-130	0			
1,1,2-Trichloroethane	1029	13	30	1000	0	103	60-125	0			
1,1-Dichloroethane	1061	11	30	1000	0	106	75-125	0			
1,1-Dichloroethene	1138	9.7	30	1000	0	114	76-148	0			
1,2,3-Trichlorobenzene	775.5	36	100	1000	0	77.6	60-135	0			
1,2,4-Trichlorobenzene	803.5	34	100	1000	0	80.4	65-130	0			
1,2-Dibromo-3-chloropropane	836.5	28	100	1000	0	83.6	40-135	0			
1,2-Dibromoethane	1040	8.4	30	1000	0	104	80-195	0			
1,2-Dichlorobenzene	1056	11	30	1000	0	106	75-120	0			
1,2-Dichloroethane	1012	45	100	1000	0	101	70-135	0			
1,2-Dichloropropane	1023	22	30	1000	0	102	70-120	0			
1,3-Dichlorobenzene	1030	10	30	1000	0	103	70-125	0			
1,4-Dichlorobenzene	1030	7.2	30	1000	0	103	70-125	0			
2-Butanone	1026	25	200	1000	0	103	30-160	0			
2-Hexanone	946	15	30	1000	0	94.6	45-145	0			
4-Methyl-2-pentanone	1392	28	30	1000	0	139	74-176	0			
Acetone	989	89	100	1000	0	98.9	20-160	0			
Benzene	995	5.1	30	1000	0	99.5	75-125	0			
Bromochloromethane	921	15	30	1000	0	92.1	74-134	0			
Bromodichloromethane	1028	17	30	1000	0	103	70-130	0			
Bromoform	803.5	13	30	1000	0	80.4	55-135	0			
Bromomethane	1064	57	100	1000	0	106	50-170	0			
Carbon disulfide	1140	16	30	1000	0	114	45-160	0			
Carbon tetrachloride	946	12	30	1000	0	94.6	65-135	0			
Chlorobenzene	982.5	10	30	1000	0	98.2	75-125	0			
Chloroethane	1032	30	100	1000	0	103	40-155	0			
Chloroform	1051	11	30	1000	0	105	66-140	0			
Chloromethane	1026	82	100	1000	0	103	50-144	0			
cis-1,2-Dichloroethene	981.5	9.4	30	1000	0	98.2	65-125	0			
cis-1,3-Dichloropropene	937.5	23	30	1000	0	93.8	70-125	0			
Dibromochloromethane	895	17	30	1000	0	89.5	65-135	0			
Dichlorodifluoromethane	1144	36	100	1000	0	114	35-135	0			
Ethylbenzene	1042	6.3	30	1000	0	104	75-125	0			
Isopropylbenzene	1016	9.2	30	1000	0	102	75-130	0			
m,p-Xylene	2037	40	60	2000	0	102	80-125	0			
Methyl tert-butyl ether	946.5	8.6	30	1000	0	94.6	75-125	0			
Methylene chloride	967.5	80	250	1000	0	96.8	55-145	0			
o-Xylene	1036	12	30	1000	0	104	75-125	0			
Styrene	1037	12	30	1000	0	104	80-138	0			
Tetrachloroethene	1024	8.7	30	1000	0	102	67-167	0			
Toluene	1002	8.2	30	1000	0	100	70-125	0			
trans-1,2-Dichloroethene	985.5	11	30	1000	0	98.6	65-135	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID:**VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	931.5	17	30	1000	0	93.2	59-129	0
Trichloroethene	1024	13	30	1000	0	102	75-125	0
Trichlorofluoromethane	829.5	15	30	1000	0	83	25-185	0
Vinyl chloride	1074	20	30	1000	0	107	60-125	0
1,2-Dichloroethene, Total	1967	11	60	2000	0	98.4	65-135	0
1,3-Dichloropropene, Total	1869	23	60	2000	0	93.4	59-129	0
Xylenes, Total	3072	40	90	3000	0	102	75-125	0
Surr: 1,2-Dichloroethane-d4	*1028*	0	0	*1000*	0	*103*	*70-130*	0
Surr: 4-Bromofluorobenzene	*1013*	0	0	*1000*	0	*101*	*70-130*	0
Surr: Dibromofluoromethane	*995.5*	0	0	*1000*	0	*99.6*	*70-130*	0
Surr: Toluene-d8	*977*	0	0	*1000*	0	*97.7*	*70-130*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MS Sample ID: **20080945-03A MS** Units: **µg/Kg-dry** Analysis Date: **8/15/2020 04:19 AM**

Client ID: Run ID: **VMS7_200814A** SeqNo: **6639616** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	885.1	12	27	915.8	0	96.6	70-135	0			
1,1,2,2-Tetrachloroethane	291.2	12	27	915.8	0	31.8	55-130	0			S
1,1,2-Trichloroethane	887.4	12	27	915.8	0	96.9	60-125	0			
1,1-Dichloroethane	904.3	10	27	915.8	0	98.7	75-125	0			
1,1-Dichloroethene	908.4	8.9	27	915.8	0	99.2	76-148	0			
1,2,3-Trichlorobenzene	908	33	92	915.8	0	99.1	60-135	0			
1,2,4-Trichlorobenzene	908	31	92	915.8	0	99.1	65-130	0			
1,2-Dibromo-3-chloropropane	728.5	25	92	915.8	0	79.5	40-135	0			
1,2-Dibromoethane	804.9	7.7	27	915.8	0	87.9	80-195	0			
1,2-Dichlorobenzene	839.3	10	27	915.8	0	91.7	75-120	0			
1,2-Dichloroethane	904.3	41	92	915.8	0	98.7	70-135	0			
1,2-Dichloropropane	864	20	27	915.8	0	94.3	70-120	0			
1,3-Dichlorobenzene	859.4	9.2	27	915.8	0	93.8	70-125	0			
1,4-Dichlorobenzene	853	6.6	27	915.8	0	93.1	70-125	0			
2-Butanone	1149	23	180	915.8	0	125	30-160	0			
2-Hexanone	1147	14	27	915.8	0	125	45-145	0			
4-Methyl-2-pentanone	1014	26	27	915.8	0	111	74-176	0			
Acetone	1713	82	92	915.8	0	187	20-160	0			S
Benzene	890.1	4.7	27	915.8	0	97.2	75-125	0			
Bromochloromethane	914.4	14	27	915.8	0	99.8	74-134	0			
Bromodichloromethane	776.6	15	27	915.8	0	84.8	70-130	0			
Bromoform	659.3	12	27	915.8	0	72	55-135	0			
Bromomethane	653.8	53	92	915.8	0	71.4	50-170	0			
Carbon disulfide	839.7	14	27	915.8	0	91.7	45-160	0			
Carbon tetrachloride	777	11	27	915.8	0	84.9	65-135	0			
Chlorobenzene	836.5	9.1	27	915.8	0	91.4	75-125	0			
Chloroethane	U	27	92	915.8	0	0	40-155	0			S
Chloroform	853.5	10	27	915.8	0	93.2	66-140	0			
Chloromethane	651.1	75	92	915.8	0	71.1	50-144	0			
cis-1,2-Dichloroethene	857.6	8.6	27	915.8	0	93.7	65-125	0			
cis-1,3-Dichloropropene	746.3	21	27	915.8	0	81.5	70-125	0			
Dibromochloromethane	666.7	15	27	915.8	0	72.8	65-135	0			
Dichlorodifluoromethane	919.9	33	92	915.8	0	100	35-135	0			
Ethylbenzene	868.6	5.8	27	915.8	0	94.9	75-125	0			
Isopropylbenzene	878.7	8.4	27	915.8	0	95.9	75-130	0			
m,p-Xylene	1606	37	55	1832	0	87.7	80-125	0			
Methyl tert-butyl ether	831.5	7.9	27	915.8	0	90.8	75-125	0			
Methylene chloride	830.6	73	230	915.8	0	90.7	55-145	0			
o-Xylene	864	11	27	915.8	0	94.3	75-125	0			
Styrene	868.6	11	27	915.8	0	94.9	80-138	0			
Tetrachloroethene	1572	8	27	915.8	0	172	67-167	0			S
Toluene	851.6	7.5	27	915.8	0	93	70-125	0			
trans-1,2-Dichloroethene	908.4	10	27	915.8	0	99.2	65-135	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	714.7	15	27	915.8	0	78.1	59-129	0	
Trichloroethene	1340	12	27	915.8	0	146	75-125	0	S
Trichlorofluoromethane	653.8	14	27	915.8	0	71.4	25-185	0	
Vinyl chloride	907	18	27	915.8	0	99	60-125	0	
1,2-Dichloroethene, Total	1766	10	55	1832	0	96.4	65-135	0	
Xylenes, Total	2470	37	82	2747	0	89.9	75-125	0	
Surr: 1,2-Dichloroethane-d4	*951.5*	0	0	*915.8*	0	*104*	*70-130*	0	
Surr: 4-Bromofluorobenzene	*955.6*	0	0	*915.8*	0	*104*	*70-130*	0	
Surr: Dibromofluoromethane	*930.9*	0	0	*915.8*	0	*102*	*70-130*	0	
Surr: Toluene-d8	*910.3*	0	0	*915.8*	0	*99.4*	*70-130*	0	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MS Sample ID: **20080952-03A MS** Units: **µg/Kg-dry** Analysis Date: **8/17/2020 09:24 PM**

Client ID: Run ID: **VMS11_200817A** SeqNo: **6641119** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	881.9	11	25	834.7	0	106	70-135	0			
1,1,2,2-Tetrachloroethane	517.1	11	25	834.7	0	62	55-130	0			
1,1,2-Trichloroethane	756.3	11	25	834.7	0	90.6	60-125	0			
1,1-Dichloroethane	895.2	9.1	25	834.7	0	107	75-125	0			
1,1-Dichloroethene	969.5	8.1	25	834.7	0	116	76-148	0			
1,2,3-Trichlorobenzene	764.6	30	83	834.7	0	91.6	60-135	0			
1,2,4-Trichlorobenzene	720.8	28	83	834.7	0	86.3	65-130	0			
1,2-Dibromo-3-chloropropane	1060	23	83	834.7	1805	-89.2	40-135	0			S
1,2-Dibromoethane	806.8	7	25	834.7	0	96.7	80-195	0			
1,2-Dichlorobenzene	748.7	9.5	25	834.7	0	89.7	75-120	0			
1,2-Dichloroethane	833.1	38	83	834.7	0	99.8	70-135	0			
1,2-Dichloropropane	805.5	18	25	834.7	0	96.5	70-120	0			
1,3-Dichlorobenzene	790.9	8.4	25	834.7	0	94.8	70-125	0			
1,4-Dichlorobenzene	783	6	25	834.7	0	93.8	70-125	0			
2-Butanone	1683	21	170	834.7	0	202	30-160	0			S
2-Hexanone	1288	12	25	834.7	0	154	45-145	0			S
4-Methyl-2-pentanone	894.4	23	25	834.7	0	107	74-176	0			
Acetone	2062	74	83	834.7	10.1	246	20-160	0			S
Benzene	864.8	4.3	25	834.7	0	104	75-125	0			
Bromochloromethane	876.5	13	25	834.7	0	105	74-134	0			
Bromodichloromethane	854.3	14	25	834.7	0	102	70-130	0			
Bromoform	636.1	11	25	834.7	0	76.2	55-135	0			
Bromomethane	613.1	48	83	834.7	0	73.5	50-170	0			
Carbon disulfide	925.7	13	25	834.7	0	111	45-160	0			
Carbon tetrachloride	859.8	9.8	25	834.7	0	103	65-135	0			
Chlorobenzene	736.6	8.3	25	834.7	0	88.3	75-125	0			
Chloroethane	943.2	25	83	834.7	0	113	40-155	0			
Chloroform	893.2	9.2	25	834.7	0	107	66-140	0			
Chloromethane	985.4	68	83	834.7	19.57	116	50-144	0			
cis-1,2-Dichloroethene	902.8	7.8	25	834.7	0	108	65-125	0			
cis-1,3-Dichloropropene	799.7	19	25	834.7	0	95.8	70-125	0			
Dibromochloromethane	662.4	14	25	834.7	0	79.3	65-135	0			
Dichlorodifluoromethane	1095	30	83	834.7	0	131	35-135	0			
Ethylbenzene	780.9	5.3	25	834.7	0	93.5	75-125	0			
Isopropylbenzene	796.7	7.6	25	834.7	0	95.4	75-130	0			
m,p-Xylene	1521	33	50	1669	0	91.1	80-125	0			
Methyl tert-butyl ether	869.4	7.2	25	834.7	0	104	75-125	0			
Methylene chloride	882.3	66	210	834.7	0	106	55-145	0			
o-Xylene	771.3	9.7	25	834.7	0	92.4	75-125	0			
Styrene	787.6	9.9	25	834.7	0	94.3	80-138	0			
Tetrachloroethene	1533	7.3	25	834.7	0	184	67-167	0			S
Toluene	801.8	6.8	25	834.7	0	96	70-125	0			
trans-1,2-Dichloroethene	923.6	9.2	25	834.7	0	111	65-135	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	740	14	25	834.7	0	88.7	59-129	0	
Trichloroethene	1071	11	25	834.7	0	128	75-125	0	S
Trichlorofluoromethane	750.4	13	25	834.7	0	89.9	25-185	0	
Vinyl chloride	984.1	17	25	834.7	0	118	60-125	0	
1,2-Dichloroethene, Total	1826	9.2	50	1669	0	109	65-135	0	
1,3-Dichloropropene, Total	1540	19	50	1669	0	92.2	59-129	0	
Xylenes, Total	2292	33	75	2504	0	91.5	75-125	0	
Surr: 1,2-Dichloroethane-d4	*826*	0	0	*834.7*	0	*98.9*	*70-130*	0	
Surr: 4-Bromofluorobenzene	*852.3*	0	0	*834.7*	0	*102*	*70-130*	0	
Surr: Dibromofluoromethane	*868.1*	0	0	*834.7*	0	*104*	*70-130*	0	
Surr: Toluene-d8	*800.5*	0	0	*834.7*	0	*95.9*	*70-130*	0	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MS Sample ID: **20080947-03A MS** Units: **µg/Kg-dry** Analysis Date: **8/19/2020 04:05 AM**

Client ID: Run ID: **VMS8_200818B** SeqNo: **6644955** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	716.4	9.8	22	723.6	0	99	70-135	0			
1,1,2,2-Tetrachloroethane	160.6	9.6	22	723.6	0	22.2	55-130	0			S
1,1,2-Trichloroethane	682.3	9.2	22	723.6	0	94.3	60-125	0			
1,1-Dichloroethane	626.3	7.9	22	723.6	0	86.5	75-125	0			
1,1-Dichloroethene	772.1	7	22	723.6	0	107	76-148	0			
1,2,3-Trichlorobenzene	528.6	26	72	723.6	0	73	60-135	0			
1,2,4-Trichlorobenzene	547.8	25	72	723.6	0	75.7	65-130	0			
1,2-Dibromo-3-chloropropane	487	20	72	723.6	0	67.3	40-135	0			
1,2-Dibromoethane	683.1	6.1	22	723.6	0	94.4	80-195	0			
1,2-Dichlorobenzene	650.5	8.2	22	723.6	0	89.9	75-120	0			
1,2-Dichloroethane	670	33	72	723.6	0	92.6	70-135	0			
1,2-Dichloropropane	687	16	22	723.6	0	95	70-120	0			
1,3-Dichlorobenzene	674.7	7.2	22	723.6	0	93.3	70-125	0			
1,4-Dichlorobenzene	674.7	5.2	22	723.6	0	93.3	70-125	0			
2-Butanone	1212	18	140	723.6	0	167	30-160	0			S
2-Hexanone	885.7	11	22	723.6	0	122	45-145	0			
4-Methyl-2-pentanone	656.7	20	22	723.6	0	90.8	74-176	0			
Acetone	1707	64	72	723.6	0	236	20-160	0			S
Benzene	661.7	3.7	22	723.6	0	91.4	75-125	0			
Bromochloromethane	605.3	11	22	723.6	0	83.6	74-134	0			
Bromodichloromethane	650.1	12	22	723.6	0	89.9	70-130	0			
Bromoform	516.3	9.1	22	723.6	0	71.3	55-135	0			
Bromomethane	664.3	42	72	723.6	0	91.8	50-170	0			
Carbon disulfide	703.3	11	22	723.6	0	97.2	45-160	0			
Carbon tetrachloride	620.5	8.5	22	723.6	0	85.7	65-135	0			
Chlorobenzene	644.4	7.2	22	723.6	0	89.1	75-125	0			
Chloroethane	224.3	21	72	723.6	0	31	40-155	0			S
Chloroform	694.6	8	22	723.6	0	96	66-140	0			
Chloromethane	711.7	59	72	723.6	0	98.4	50-144	0			
cis-1,2-Dichloroethene	625.2	6.8	22	723.6	0	86.4	65-125	0			
cis-1,3-Dichloropropene	615.4	16	22	723.6	0	85	70-125	0			
Dibromochloromethane	542.3	12	22	723.6	0	75	65-135	0			
Dichlorodifluoromethane	805.7	26	72	723.6	0	111	35-135	0			
Ethylbenzene	685.2	4.6	22	723.6	0	94.7	75-125	0			
Isopropylbenzene	676.9	6.6	22	723.6	0	93.5	75-130	0			
m,p-Xylene	1340	29	43	1447	0	92.6	80-125	0			
Methyl tert-butyl ether	607.5	6.3	22	723.6	0	84	75-125	0			
Methylene chloride	620.1	58	180	723.6	0	85.7	55-145	0			
o-Xylene	691	8.4	22	723.6	0	95.5	75-125	0			
Styrene	678	8.6	22	723.6	0	93.7	80-138	0			
Tetrachloroethene	1206	6.3	22	723.6	0	167	67-167	0			
Toluene	659.6	5.9	22	723.6	0	91.1	70-125	0			
trans-1,2-Dichloroethene	663.5	8	22	723.6	0	91.7	65-135	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553**	Instrument ID:**VMS7**			Method: **SW8260C**					
trans-1,3-Dichloropropene	576	12	22	723.6	0	79.6	59-129	0	
Trichloroethene	1118	9.7	22	723.6	0	155	75-125	0	S
Trichlorofluoromethane	538	11	22	723.6	0	74.3	25-185	0	
Vinyl chloride	797.8	14	22	723.6	0	110	60-125	0	
1,2-Dichloroethene, Total	1289	8	43	1447	0	89.1	65-135	0	
Xylenes, Total	2031	29	65	2171	0	93.6	75-125	0	
Surr: 1,2-Dichloroethane-d4	*743.5*	0	0	*723.6*	0	*103*	*70-130*	0	
Surr: 4-Bromofluorobenzene	*738.4*	0	0	*723.6*	0	*102*	*70-130*	0	
Surr: Dibromofluoromethane	*683.4*	0	0	*723.6*	0	*94.5*	*70-130*	0	
Surr: Toluene-d8	*709.1*	0	0	*723.6*	0	*98*	*70-130*	0	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MSD Sample ID: **20080945-03A MSD** Units: **µg/Kg-dry** Analysis Date: **8/15/2020 04:35 AM**

Client ID: Run ID: **VMS7_200814A** SeqNo: **6639617** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	766.5	12	25	847.5	0	90.5	70-135	885.1	14.4	30	
1,1,2,2-Tetrachloroethane	239.8	11	25	847.5	0	28.3	55-130	291.2	19.3	30	S
1,1,2-Trichloroethane	765.3	11	25	847.5	0	90.3	60-125	887.4	14.8	30	
1,1-Dichloroethane	783.5	9.3	25	847.5	0	92.5	75-125	904.3	14.3	30	
1,1-Dichloroethene	814.4	8.2	25	847.5	0	96.1	76-148	908.4	10.9	30	
1,2,3-Trichlorobenzene	844.5	31	85	847.5	0	99.7	60-135	908	7.24	30	
1,2,4-Trichlorobenzene	844.5	29	85	847.5	0	99.7	65-130	908	7.24	30	
1,2-Dibromo-3-chloropropane	655.9	23	85	847.5	0	77.4	40-135	728.5	10.5	30	
1,2-Dibromoethane	724.2	7.1	25	847.5	0	85.5	80-195	804.9	10.6	30	
1,2-Dichlorobenzene	753.8	9.6	25	847.5	0	89	75-120	839.3	10.7	30	
1,2-Dichloroethane	800	38	85	847.5	0	94.4	70-135	904.3	12.2	30	
1,2-Dichloropropane	794.9	19	25	847.5	0	93.8	70-120	864	8.33	30	
1,3-Dichlorobenzene	756.8	8.5	25	847.5	0	89.3	70-125	859.4	12.7	30	
1,4-Dichlorobenzene	753	6.1	25	847.5	0	88.8	70-125	853	12.5	30	
2-Butanone	1179	21	170	847.5	0	139	30-160	1149	2.61	30	
2-Hexanone	1044	13	25	847.5	0	123	45-145	1147	9.31	30	
4-Methyl-2-pentanone	910.6	24	25	847.5	0	107	74-176	1014	10.8	30	
Acetone	1842	75	85	847.5	0	217	20-160	1713	7.23	30	S
Benzene	769.5	4.3	25	847.5	0	90.8	75-125	890.1	14.5	30	
Bromochloromethane	833.5	13	25	847.5	0	98.4	74-134	914.4	9.26	30	
Bromodichloromethane	680.9	14	25	847.5	0	80.4	70-130	776.6	13.1	30	
Bromoform	591.5	11	25	847.5	0	69.8	55-135	659.3	10.8	30	
Bromomethane	727.5	49	85	847.5	0	85.9	50-170	653.8	10.7	30	
Carbon disulfide	742.8	13	25	847.5	0	87.7	45-160	839.7	12.3	30	
Carbon tetrachloride	680.1	9.9	25	847.5	0	80.2	65-135	777	13.3	30	
Chlorobenzene	741.5	8.4	25	847.5	0	87.5	75-125	836.5	12	30	
Chloroethane	U	25	85	847.5	0	0	40-155	0	0	30	S
Chloroform	759.7	9.3	25	847.5	0	89.6	66-140	853.5	11.6	30	
Chloromethane	576.7	69	85	847.5	0	68	50-144	651.1	12.1	30	
cis-1,2-Dichloroethene	776.3	8	25	847.5	0	91.6	65-125	857.6	9.96	30	
cis-1,3-Dichloropropene	655.9	19	25	847.5	0	77.4	70-125	746.3	12.9	30	
Dibromochloromethane	595.3	14	25	847.5	0	70.2	65-135	666.7	11.3	30	
Dichlorodifluoromethane	803.8	31	85	847.5	0	94.9	35-135	919.9	13.5	30	
Ethylbenzene	742.8	5.4	25	847.5	0	87.7	75-125	868.6	15.6	30	
Isopropylbenzene	747.5	7.8	25	847.5	0	88.2	75-130	878.7	16.1	30	
m,p-Xylene	1369	34	51	1695	0	80.8	80-125	1606	15.9	30	
Methyl tert-butyl ether	747.5	7.3	25	847.5	0	88.2	75-125	831.5	10.6	30	
Methylene chloride	760.2	67	210	847.5	0	89.7	55-145	830.6	8.85	30	
o-Xylene	767.4	9.8	25	847.5	0	90.5	75-125	864	11.8	30	
Styrene	757.2	10	25	847.5	0	89.4	80-138	868.6	13.7	30	
Tetrachloroethene	1350	7.4	25	847.5	0	159	67-167	1572	15.2	30	
Toluene	733.9	6.9	25	847.5	0	86.6	70-125	851.6	14.9	30	
trans-1,2-Dichloroethene	806.4	9.3	25	847.5	0	95.1	65-135	908.4	11.9	30	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	614	14	25	847.5	0	72.4	59-129	714.7	15.2	30	
Trichloroethene	1206	11	25	847.5	0	142	75-125	1340	10.5	30	S
Trichlorofluoromethane	453	13	25	847.5	0	53.4	25-185	653.8	36.3	30	R
Vinyl chloride	798.7	17	25	847.5	0	94.2	60-125	907	12.7	30	
1,2-Dichloroethene, Total	1583	9.3	51	1695	0	93.4	65-135	1766	11	30	
Xylenes, Total	2137	34	76	2542	0	84.1	75-125	2470	14.5	30	
Surr: 1,2-Dichloroethane-d4	*896.2*	0	0	*847.5*	0	*106*	*70-130*	951.5	*5.98*	*30*	
Surr: 4-Bromofluorobenzene	*859.3*	0	0	*847.5*	0	*101*	*70-130*	955.6	*10.6*	*30*	
Surr: Dibromofluoromethane	*859.7*	0	0	*847.5*	0	*101*	*70-130*	930.9	*7.94*	*30*	
Surr: Toluene-d8	*833.9*	0	0	*847.5*	0	*98.4*	*70-130*	910.3	*8.76*	*30*	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MSD Sample ID: **20080952-03A MSD** Units: **µg/Kg-dry** Analysis Date: **8/17/2020 09:46 PM**

Client ID: Run ID: **VMS11_200817A** SeqNo: **6641120** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	1135	16	35	1157	0	98.1	70-135	881.9	25.1	30	
1,1,2,2-Tetrachloroethane	903.9	15	35	1157	0	78.1	55-130	517.1	54.4	30	R
1,1,2-Trichloroethane	1005	15	35	1157	0	86.8	60-125	756.3	28.3	30	
1,1-Dichloroethane	1155	13	35	1157	0	99.8	75-125	895.2	25.3	30	
1,1-Dichloroethene	1249	11	35	1157	0	108	76-148	969.5	25.2	30	
1,2,3-Trichlorobenzene	1118	42	120	1157	0	96.6	60-135	764.6	37.5	30	R
1,2,4-Trichlorobenzene	1026	39	120	1157	0	88.6	65-130	720.8	34.9	30	R
1,2-Dibromo-3-chloropropane	1293	32	120	1157	1805	-44.2	40-135	1060	19.8	30	S
1,2-Dibromoethane	1081	9.8	35	1157	0	93.4	80-195	806.8	29.1	30	
1,2-Dichlorobenzene	999.4	13	35	1157	0	86.3	75-120	748.7	28.7	30	
1,2-Dichloroethane	1058	52	120	1157	0	91.4	70-135	833.1	23.8	30	
1,2-Dichloropropane	1047	26	35	1157	0	90.5	70-120	805.5	26.1	30	
1,3-Dichlorobenzene	1043	12	35	1157	0	90.1	70-125	790.9	27.5	30	
1,4-Dichlorobenzene	1061	8.4	35	1157	0	91.6	70-125	783	30.1	30	R
2-Butanone	2174	29	230	1157	0	188	30-160	1683	25.5	30	S
2-Hexanone	1733	17	35	1157	0	150	45-145	1288	29.4	30	S
4-Methyl-2-pentanone	1290	32	35	1157	0	111	74-176	894.4	36.2	30	R
Acetone	2644	100	120	1157	10.1	228	20-160	2062	24.7	30	S
Benzene	1128	5.9	35	1157	0	97.5	75-125	864.8	26.5	30	
Bromochloromethane	1127	18	35	1157	0	97.4	74-134	876.5	25	30	
Bromodichloromethane	1133	19	35	1157	0	97.9	70-130	854.3	28.1	30	
Bromoform	838	15	35	1157	0	72.4	55-135	636.1	27.4	30	
Bromomethane	832.2	66	120	1157	0	71.9	50-170	613.1	30.3	30	R
Carbon disulfide	1184	18	35	1157	0	102	45-160	925.7	24.5	30	
Carbon tetrachloride	1105	14	35	1157	0	95.5	65-135	859.8	24.9	30	
Chlorobenzene	971.6	12	35	1157	0	83.9	75-125	736.6	27.5	30	
Chloroethane	1152	34	120	1157	0	99.5	40-155	943.2	19.9	30	
Chloroform	1157	13	35	1157	0	99.9	66-140	893.2	25.7	30	
Chloromethane	1293	95	120	1157	19.57	110	50-144	985.4	27	30	
cis-1,2-Dichloroethene	1183	11	35	1157	0	102	65-125	902.8	26.9	30	
cis-1,3-Dichloropropene	1031	26	35	1157	0	89	70-125	799.7	25.2	30	
Dibromochloromethane	867.5	20	35	1157	0	74.9	65-135	662.4	26.8	30	
Dichlorodifluoromethane	1466	42	120	1157	0	127	35-135	1095	28.9	30	
Ethylbenzene	1014	7.3	35	1157	0	87.6	75-125	780.9	26	30	
Isopropylbenzene	1040	11	35	1157	0	89.8	75-130	796.7	26.5	30	
m,p-Xylene	2023	46	69	2315	0	87.4	80-125	1521	28.3	30	
Methyl tert-butyl ether	1139	10	35	1157	0	98.4	75-125	869.4	26.9	30	
Methylene chloride	1105	92	290	1157	0	95.5	55-145	882.3	22.4	30	
o-Xylene	1016	13	35	1157	0	87.8	75-125	771.3	27.4	30	
Styrene	1048	14	35	1157	0	90.5	80-138	787.6	28.4	30	
Tetrachloroethene	1980	10	35	1157	0	171	67-167	1533	25.4	30	S
Toluene	1054	9.5	35	1157	0	91	70-125	801.8	27.2	30	
trans-1,2-Dichloroethene	1209	13	35	1157	0	104	65-135	923.6	26.8	30	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **161553** Instrument ID:**VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	960.6	19	35	1157	0	83	59-129	740	26	30	
Trichloroethene	1223	16	35	1157	0	106	75-125	1071	13.2	30	
Trichlorofluoromethane	987.3	18	35	1157	0	85.3	25-185	750.4	27.3	30	
Vinyl chloride	1281	23	35	1157	0	111	60-125	984.1	26.2	30	
1,2-Dichloroethene, Total	2392	13	69	2315	0	103	65-135	1826	26.8	30	
Xylenes, Total	3039	46	100	3472	0	87.5	75-125	2292	28	30	
Surr: 1,2-Dichloroethane-d4	*1128*	0	0	*1157*	0	*97.5*	*70-130*	826	*31*	*30*	*R*
Surr: 4-Bromofluorobenzene	*1180*	0	0	*1157*	0	*102*	*70-130*	852.3	*32.3*	*30*	*R*
Surr: Dibromofluoromethane	*1182*	0	0	*1157*	0	*102*	*70-130*	868.1	*30.6*	*30*	*R*
Surr: Toluene-d8	*1110*	0	0	*1157*	0	*95.9*	*70-130*	800.5	*32.4*	*30*	*R*

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID: **VMS7** Method: **SW8260C**

MSD Sample ID: **20080947-03A MSD** Units: **µg/Kg-dry** Analysis Date: **8/19/2020 04:21 AM**

Client ID: Run ID: **VMS8_200818B** SeqNo: **6644956** Prep Date: **8/13/2020** DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	784.8	11	23	774	0	101	70-135	716.4	9.12	30	
1,1,2,2-Tetrachloroethane	176.5	10	23	774	0	22.8	55-130	160.6	9.39	30	S
1,1,2-Trichloroethane	777.5	9.9	23	774	0	100	60-125	682.3	13	30	
1,1-Dichloroethane	685.8	8.5	23	774	0	88.6	75-125	626.3	9.07	30	
1,1-Dichloroethene	805.3	7.5	23	774	0	104	76-148	772.1	4.22	30	
1,2,3-Trichlorobenzene	612.2	28	77	774	0	79.1	60-135	528.6	14.7	30	
1,2,4-Trichlorobenzene	607.2	26	77	774	0	78.4	65-130	547.8	10.3	30	
1,2-Dibromo-3-chloropropane	575.9	21	77	774	0	74.4	40-135	487	16.7	30	
1,2-Dibromoethane	771.3	6.5	23	774	0	99.6	80-195	683.1	12.1	30	
1,2-Dichlorobenzene	747.3	8.8	23	774	0	96.5	75-120	650.5	13.8	30	
1,2-Dichloroethane	745	35	77	774	0	96.2	70-135	670	10.6	30	
1,2-Dichloropropane	733.4	17	23	774	0	94.7	70-120	687	6.52	30	
1,3-Dichlorobenzene	760.4	7.7	23	774	0	98.2	70-125	674.7	11.9	30	
1,4-Dichlorobenzene	760.4	5.6	23	774	0	98.2	70-125	674.7	11.9	30	
2-Butanone	1374	19	150	774	0	178	30-160	1212	12.6	30	S
2-Hexanone	1013	12	23	774	0	131	45-145	885.7	13.4	30	
4-Methyl-2-pentanone	761.6	22	23	774	0	98.4	74-176	656.7	14.8	30	
Acetone	1964	69	77	774	0	254	20-160	1707	14	30	S
Benzene	728.7	4	23	774	0	94.1	75-125	661.7	9.64	30	
Bromochloromethane	661	12	23	774	0	85.4	74-134	605.3	8.8	30	
Bromodichloromethane	727.6	13	23	774	0	94	70-130	650.1	11.2	30	
Bromoform	595.6	9.8	23	774	0	76.9	55-135	516.3	14.3	30	
Bromomethane	676.1	44	77	774	0	87.4	50-170	664.3	1.76	30	
Carbon disulfide	728.7	12	23	774	0	94.1	45-160	703.3	3.55	30	
Carbon tetrachloride	671.4	9.1	23	774	0	86.8	65-135	620.5	7.89	30	
Chlorobenzene	713.2	7.7	23	774	0	92.1	75-125	644.4	10.1	30	
Chloroethane	311.5	23	77	774	0	40.3	40-155	224.3	32.6	30	R
Chloroform	751.9	8.5	23	774	0	97.1	66-140	694.6	7.92	30	
Chloromethane	721.7	63	77	774	0	93.2	50-144	711.7	1.41	30	
cis-1,2-Dichloroethene	698.9	7.3	23	774	0	90.3	65-125	625.2	11.1	30	
cis-1,3-Dichloropropene	677.2	17	23	774	0	87.5	70-125	615.4	9.57	30	
Dibromochloromethane	618.8	13	23	774	0	79.9	65-135	542.3	13.2	30	
Dichlorodifluoromethane	723.3	28	77	774	0	93.4	35-135	805.7	10.8	30	
Ethylbenzene	753.5	4.9	23	774	0	97.3	75-125	685.2	9.49	30	
Isopropylbenzene	744.6	7.1	23	774	0	96.2	75-130	676.9	9.52	30	
m,p-Xylene	1478	31	46	1548	0	95.4	80-125	1340	9.76	30	
Methyl tert-butyl ether	683.8	6.7	23	774	0	88.4	75-125	607.5	11.8	30	
Methylene chloride	685.4	62	190	774	0	88.6	55-145	620.1	10	30	
o-Xylene	753.5	9	23	774	0	97.3	75-125	691	8.65	30	
Styrene	774.8	9.2	23	774	0	100	80-138	678	13.3	30	
Tetrachloroethene	1329	6.8	23	774	0	172	67-167	1206	9.74	30	S
Toluene	731	6.3	23	774	0	94.4	70-125	659.6	10.3	30	
trans-1,2-Dichloroethene	734.9	8.5	23	774	0	94.9	65-135	663.5	10.2	30	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **161553** Instrument ID:**VMS7** Method: **SW8260C**

trans-1,3-Dichloropropene	665.2	13	23	774	0	86	59-129	576	14.4	30	
Trichloroethene	1225	10	23	774	0	158	75-125	1118	9.09	30	S
Trichlorofluoromethane	558	12	23	774	0	72.1	25-185	538	3.66	30	
Vinyl chloride	808.4	15	23	774	0	104	60-125	797.8	1.33	30	
1,2-Dichloroethene, Total	1434	8.5	46	1548	0	92.6	65-135	1289	10.7	30	
1,3-Dichloropropene, Total	1342	17	46	1548	0	86.7	59-129	1200	11.2	30	
Xylenes, Total	2231	31	70	2322	0	96.1	75-125	2031	9.38	30	
Surr: 1,2-Dichloroethane-d4	*820.4*	0	0	*774*	0	*106*	*70-130*	743.5	*9.84*	*30*	
Surr: 4-Bromofluorobenzene	*805*	0	0	*774*	0	*104*	*70-130*	738.4	*8.62*	*30*	
Surr: Dibromofluoromethane	*715.9*	0	0	*774*	0	*92.5*	*70-130*	683.4	*4.65*	*30*	
Surr: Toluene-d8	*763.9*	0	0	*774*	0	*98.7*	*70-130*	709.1	*7.44*	*30*	

The following samples were analyzed in this batch:

20080750-01B	20080750-02B	20080750-03B
20080750-04B	20080750-05B	20080750-06B
20080750-07B		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **R296300A** Instrument ID: **VMS8** Method: **SW8260C**

MBLK Sample ID: **VBLKW2-200818-R296300A** Units: **µg/L** Analysis Date: **8/18/2020 09:20 PM**

Client ID: Run ID: **VMS8_200818B** SeqNo: **6644961** Prep Date: DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	U	0.46	1.0								
1,1,2,2-Tetrachloroethane	U	0.4	1.0								
1,1,2-Trichloroethane	U	0.46	1.0								
1,1,2-Trichlorotrifluoroethane	U	0.52	1.0								
1,1-Dichloroethane	U	0.44	1.0								
1,1-Dichloroethene	U	0.4	1.0								
1,2,3-Trichlorobenzene	U	0.42	1.0								
1,2,4-Trichlorobenzene	U	0.45	1.0								
1,2-Dibromo-3-chloropropane	U	0.43	1.0								
1,2-Dibromoethane	U	0.41	1.0								
1,2-Dichlorobenzene	U	0.32	1.0								
1,2-Dichloroethane	U	0.44	1.0								
1,2-Dichloropropane	U	0.48	1.0								
1,3-Dichlorobenzene	U	0.33	1.0								
1,4-Dichlorobenzene	U	0.35	1.0								
2-Butanone	U	0.52	5.0								
2-Hexanone	U	0.59	5.0								
4-Methyl-2-pentanone	U	0.52	1.0								
Acetone	U	6.2	10								
Benzene	U	0.46	1.0								
Bromochloromethane	U	0.45	1.0								
Bromodichloromethane	U	0.49	1.0								
Bromoform	U	0.56	1.0								
Bromomethane	U	0.9	1.0								
Carbon disulfide	U	0.49	1.0								
Carbon tetrachloride	U	0.4	1.0								
Chlorobenzene	U	0.4	1.0								
Chloroethane	U	0.68	1.0								
Chloroform	U	0.46	1.0								
Chloromethane	U	0.83	1.0								
cis-1,2-Dichloroethene	U	0.42	1.0								
cis-1,3-Dichloropropene	U	0.57	1.0								
Cyclohexane	U	0.63	2.0								
Dibromochloromethane	U	0.4	1.0								
Dichlorodifluoromethane	U	0.68	1.0								
Ethylbenzene	U	0.34	1.0								
Isopropylbenzene	U	0.35	1.0								
m,p-Xylene	U	0.81	2.0								
Methyl acetate	U	0.59	2.0								
Methyl tert-butyl ether	U	0.45	1.0								
Methylcyclohexane	U	0.35	1.0								
Methylene chloride	U	0.86	5.0								
o-Xylene	U	0.31	1.0								

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

QC BATCH REPORT

Batch ID: **R296300A** Instrument ID: **VMS8** Method: **SW8260C**

Styrene	U	0.33	1.0					
Tetrachloroethene	U	0.39	1.0					
Toluene	U	0.45	1.0					
trans-1,2-Dichloroethene	U	0.48	1.0					
trans-1,3-Dichloropropene	U	0.38	1.0					
Trichloroethene	U	0.43	1.0					
Trichlorofluoromethane	U	0.52	1.0					
Vinyl chloride	U	0.53	1.0					
1,2-Dichloroethene, Total	U	0.48	2.0					
1,3-Dichloropropene, Total	U	0.57	2.0					
Xylenes, Total	U	0.81	3.0					
Surr: 1,2-Dichloroethane-d4	*20.6*	0	0	*20*	0	*103*	*75-120*	0
Surr: 4-Bromofluorobenzene	*19.57*	0	0	*20*	0	*97.8*	*80-110*	0
Surr: Dibromofluoromethane	*20.61*	0	0	*20*	0	*103*	*85-115*	0
Surr: Toluene-d8	*20.21*	0	0	*20*	0	*101*	*85-110*	0

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **R296300A** Instrument ID: **VMS8** Method: **SW8260C**

LCS	Sample ID: **VLCSW2-200818-R296300A**				Units: **µg/L**			Analysis Date: **8/18/2020 08:14 PM**			
Client ID:		Run ID: **VMS8_200818B**			SeqNo: **6644960**		Prep Date:		DF: **1**		
Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	20.9	0.46	1.0	20	0	104	75-130	0			
1,1,2,2-Tetrachloroethane	21.62	0.4	1.0	20	0	108	75-130	0			
1,1,2-Trichloroethane	21.13	0.46	1.0	20	0	106	75-125	0			
1,1-Dichloroethane	21.57	0.44	1.0	20	0	108	68-142	0			
1,1-Dichloroethene	22.47	0.4	1.0	20	0	112	70-145	0			
1,2,3-Trichlorobenzene	16.72	0.42	1.0	20	0	83.6	70-140	0			
1,2,4-Trichlorobenzene	17.03	0.45	1.0	20	0	85.2	70-135	0			
1,2-Dibromo-3-chloropropane	17	0.43	1.0	20	0	85	60-130	0			
1,2-Dibromoethane	21.94	0.41	1.0	20	0	110	67-155	0			
1,2-Dichlorobenzene	20.53	0.32	1.0	20	0	103	70-130	0			
1,2-Dichloroethane	20.28	0.44	1.0	20	0	101	78-125	0			
1,2-Dichloropropane	20.65	0.48	1.0	20	0	103	75-125	0			
1,3-Dichlorobenzene	20.88	0.33	1.0	20	0	104	75-130	0			
1,4-Dichlorobenzene	20.88	0.35	1.0	20	0	104	75-130	0			
2-Butanone	21.46	0.52	5.0	20	0	107	55-150	0			
2-Hexanone	19.77	0.59	5.0	20	0	98.8	60-135	0			
4-Methyl-2-pentanone	29.29	0.52	1.0	20	0	146	77-178	0			
Acetone	20.43	6.2	10	20	0	102	60-160	0			
Benzene	19.92	0.46	1.0	20	0	99.6	70-130	0			
Bromochloromethane	18.21	0.45	1.0	20	0	91	72-141	0			
Bromodichloromethane	20.59	0.49	1.0	20	0	103	75-125	0			
Bromoform	17.46	0.56	1.0	20	0	87.3	60-125	0			
Bromomethane	23.14	0.9	1.0	20	0	116	30-185	0			
Carbon disulfide	22.28	0.49	1.0	20	0	111	60-165	0			
Carbon tetrachloride	18.46	0.4	1.0	20	0	92.3	65-140	0			
Chlorobenzene	20.06	0.4	1.0	20	0	100	80-120	0			
Chloroethane	19.86	0.68	1.0	20	0	99.3	31-172	0			
Chloroform	20.8	0.46	1.0	20	0	104	66-135	0			
Chloromethane	19.99	0.83	1.0	20	0	100	46-148	0			
cis-1,2-Dichloroethene	19.66	0.42	1.0	20	0	98.3	75-134	0			
cis-1,3-Dichloropropene	19.23	0.57	1.0	20	0	96.2	70-130	0			
Dibromochloromethane	17.99	0.4	1.0	20	0	90	60-115	0			
Dichlorodifluoromethane	22.16	0.68	1.0	20	0	111	20-120	0			
Ethylbenzene	21.09	0.34	1.0	20	0	105	76-123	0			
Isopropylbenzene	20.69	0.35	1.0	20	0	103	80-127	0			
m,p-Xylene	41.5	0.81	2.0	40	0	104	75-130	0			
Methyl tert-butyl ether	19.18	0.45	1.0	20	0	95.9	68-129	0			
Methylene chloride	19.75	0.86	5.0	20	0	98.8	72-125	0			
o-Xylene	21.07	0.31	1.0	20	0	105	76-127	0			
Styrene	21.1	0.33	1.0	20	0	106	83-137	0			
Tetrachloroethene	20.42	0.39	1.0	20	0	102	68-166	0			
Toluene	20.43	0.45	1.0	20	0	102	76-125	0			
trans-1,2-Dichloroethene	20.07	0.48	1.0	20	0	100	80-140	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **R296300A**	Instrument ID:**VMS8**			Method: **SW8260C**				
trans-1,3-Dichloropropene	19.09	0.38	1.0	20	0	95.4	56-132	0
Trichloroethene	20.29	0.43	1.0	20	0	101	77-125	0
Trichlorofluoromethane	16.6	0.52	1.0	20	0	83	60-140	0
Vinyl chloride	20.91	0.53	1.0	20	0	105	50-136	0
1,2-Dichloroethene, Total	39.73	0.48	2.0	40	0	99.3	75-140	0
1,3-Dichloropropene, Total	38.32	0.57	2.0	40	0	95.8	56-132	0
Xylenes, Total	62.57	0.81	3.0	60	0	104	76-127	0
Surr: 1,2-Dichloroethane-d4	*20.33*	0	0	*20*	0	*102*	*75-120*	0
Surr: 4-Bromofluorobenzene	*20.2*	0	0	*20*	0	*101*	*80-110*	0
Surr: Dibromofluoromethane	*19.89*	0	0	*20*	0	*99.4*	*85-115*	0
Surr: Toluene-d8	*20.05*	0	0	*20*	0	*100*	*85-110*	0

The following samples were analyzed in this batch: 20080750-08A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Terracon
Work Order: 20080750
Project: N2207019

QC BATCH REPORT

Batch ID: **R296480** Instrument ID: **MOIST** Method: **SW3550C**

MBLK Sample ID: **WBLKS-R296480** Units: **% of sample** Analysis Date: **8/20/2020 10:13 AM**
Client ID: Run ID: **MOIST_200820A** SeqNo: **6650740** Prep Date: DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	U	0.1	0.10								

LCS Sample ID: **LCS-R296480** Units: **% of sample** Analysis Date: **8/20/2020 10:13 AM**
Client ID: Run ID: **MOIST_200820A** SeqNo: **6650739** Prep Date: DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	100	0.1	0.10	100	0	100	98-102	0			

DUP Sample ID: **20081184-07B DUP** Units: **% of sample** Analysis Date: **8/20/2020 10:13 AM**
Client ID: Run ID: **MOIST_200820A** SeqNo: **6650730** Prep Date: DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	10.51	0.1	0.10	0	0	0	0-0	10.9	3.64	10	

DUP Sample ID: **20081189-03B DUP** Units: **% of sample** Analysis Date: **8/20/2020 10:13 AM**
Client ID: Run ID: **MOIST_200820A** SeqNo: **6650738** Prep Date: DF: **1**

Analyte	Result	MDL	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	14	0.1	0.10	0	0	0	0-0	14.28	1.98	10	

The following samples were analyzed in this batch:

20080750-01C	20080750-02C	20080750-03C
20080750-04C	20080750-05C	20080750-06C
20080750-07C		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

☒ **ALS**
1740 Union Carbide Drive
South Charleston, WV 25303
(Tel) 304.356.3168
(Fax) 304.205.6262

Chain of Custody Form

Page 1 of 1

8208

☐ **ALS**
3352 128th Avenue
Holland, Michigan 49424
(Tel) 616.399.6070
(Fax) 616.399.6185

ALS Project Manager: | **ALS Work Order #:** 20090750

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name		A	DRO
Work Order		Project Number	N220701 9	B	GRO
Company Name	Terracon	Bill To Company	SAME	C	VOCs
Send Report To	Levi Sheff	Invoice Attn.		D	
Address	912 Morris St.	Address		E	
				F	
City/State/Zip	Charleston/WV/25301	City/State/Zip		G	
Phone	681-587-7073	Phone		H	
Fax		Fax		I	
e-Mail Address	Levi.Sheff@Terracon.com			J	

No.	Sample Description	Comp / Grab	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SP-1 (6-8')	G	8-11-20	12:15p	Soil	Y	5	X	X	X								
2	SP-2 (2-4')	G		11:50A	Soil	Y	5	X	X	X								
3	SP-3 (6-8')	G		11:15A	Soil	Y	5	X	X	X								
4	SP-4 (2-4')	G		9:30A	Soil	Y	5	X	X	X								
5	SP-5 (4-6')	G		11:00A	Soil	Y	5	X	X	X								
6	SP-6 (8-10')	G		10:00A	Soil	Y	5	X	X	X								
7	SP-7 (18-20')	G		10:30A	Soil	Y	5	X	X	X								
8	TRIP BLANK	G	8/11/2020	0930	W	1, 8	2			X								
9																		
10																		

Sampler(s): Please Print & Sign
Levi Sheff

Shipment Method: Drop-off

Turnaround Time in Business Days (BD): ☒ 10 BD(STD) ☐ 5 BD ☐ 3 BD ☐ 2 BD ☐ 1 BD ☐ Other

Results Due Date:

Relinquished by:	Date:	Time:	Received by:
	8-11-20	1334	
Relinquished by:	Date:	Time:	Received by:
	8/11/2020	1700 +3349	FED EX
Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by (Laboratory):
FED EX	8/13/20	1030	
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):

Temp: 20° ACSC

Notes: Removed Ice Packs Prior to drop off

Temp: ALS MN 16.0°C IR1

QC Package: (Check Box Below)

- ☐ Level II: Standard QC
- ☐ Level III: Standard QC + Raw Data
- ☐ Level IV: SW846 Methods/CLP
- ☐ Other:

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C

Note: Any changes must be made in writing once samples and COC Form have been submitted to ALS

Copyright 2014 by ALS

ALS Environmental

2008752

Sample Receiving Checklist

Received by:	Teneta Smith
Date/Time:	8/11/2020 1334
Carrier Name:	Client
Shipping container/cooler in good condition?	(Yes) / No / Not Present
Custody seals intact on shipping container/cooler?	Yes / No / (Not Present)
Custody seals intact on sample bottles?	Yes / No / (Not Present)
Chain of Custody present?	(Yes) / No
COC signed when relinquished and received?	(Yes) / No
COC agrees with sample labels?	(Yes) / No
Samples in proper container/bottle?	(Yes) / No
Sample containers intact?	(Yes) / No
Sufficient sample volume for indicated test?	(Yes) / No
All samples received within holding time?	(Yes) / No
All sample temperatures verified to be in compliance?	Yes / (No)
Temperature(s) (°C):	>6 2 ASTC
Thermometer(s):	IR
Sample(s) received on ice?	Yes / (No)
Matrix/Matrices:	So.l
Cooler(s)/Kit(s):	
Date/Time sample(s) sent to storage:	
Trip Blanks included? (for volatile analysis only)	(Yes) / No / N/A
Water – VOA vials have zero headspace?	Yes / No / (No Vials)
Water – pH acceptable upon receipt?	Yes / No / (N/A)
pH strip lot #:	
pH adjusted (note adjustments below)?	Yes / No / (N/A)
pH adjusted by:	

Login Notes:

ALS Group, USA

Sample Receipt Checklist

Client Name: **TERRACON** Date/Time Received: **11-Aug-20 13:34**

Work Order: **20080750** Received by: **DS**

Checklist completed by: Diane Shaw (eSignature) 13-Aug-20 (Date) Reviewed by: Rebecca Kiser (eSignature) 14-Aug-20 (Date)

Matrices: Soil, Water

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	<6.0 c	IR1	
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	8/13/2020 2:56:33 PM		
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

Asbestos Survey

Three Structures
West Virginia State Capitol Complex
321 Michigan Avenue
Charleston, WV 25305
June 8, 2020
Terracon Project No. N2207016





Prepared for:
The Chapman Technical Group
200 Sixth Avenue
Saint Albans, WV 25177

Prepared by:
Terracon Consultants, Inc.
611 Lunken Park Drive
Cincinnati, Ohio 45226

June 8, 2020

The Chapman Technical Group
200 Sixth Avenue
Saint Albans, WV 25177

Attn: Mr. Joe Bird, PLA, ASLA
P: (304) 727-5501 ext. 154
E: jbird@chaptech.com

Re: Asbestos Survey Report
Three Structures
West Virginia State Capitol Complex
321 Michigan Avenue
Charleston, West Virginia 25305
Terracon Project No. N2207016

Dear Mr. Bird:

Terracon Consultants, Inc. (Terracon) is pleased to submit the attached report for the above-referenced project to The Chapman Technical Group (Client). The purpose of this report is to present the results of an asbestos survey which was performed at the site on May 27, 2020 and in general accordance with our proposal dated September 10, 2019. We understand that this survey was requested in support of the planned renovation or demolition pertaining to three structures (Building 33, a maintenance garage, and a storage shed) located at the West Virginia State Capitol Complex, 321 Michigan Avenue in Charleston, West Virginia.

Terracon appreciates the opportunity to provide this service to The Chapman Technical Group. If you have any questions regarding this report please contact the undersigned at 513-321-5816.

Sincerely,
Terracon Consultants, Inc.

Joshua Vogel
Project Manager

Joseph A. Tussey, CHMM
Sr. Associate/Group Manager

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EXECUTIVE SUMMARY

Terracon Consultants, Inc. (Terracon) conducted an asbestos survey of three structures (Building 33, a maintenance garage and a storage shed) at the West Virginia State Capitol Complex located at 321 Michigan Avenue in Charleston, West Virginia. We understand that this survey was requested as required by the United States Environmental Protection Agency (USEPA) National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation 40 CFR Part 61, Subpart M for the purpose of a planned renovation or demolition pertaining to the three structures. The survey included identifying and sampling accessible suspect asbestos-containing materials (ACM) for laboratory analysis, and providing information regarding the identity, location, condition, and approximate quantities of ACM, if any, associated with interior and exterior building components. The survey was performed on May 27, 2020 by a USEPA-accredited and state of West Virginia licensed asbestos inspector in general accordance with our proposal dated September 10, 2019, and the sampling protocols established in USEPA 40 Code of Federal Regulations (CFR) Part 763, Subpart E, known as the Asbestos Hazard Emergency Response Act (AHERA). Terracon collected a total of 62 bulk samples from 18 homogeneous areas of suspect ACM. Please note that previous asbestos reports were also provided by the Client to Terracon for review prior to the field survey. Information from the prior reports was integrated into our survey as feasible.

Based on the results of laboratory analysis in regard to the samples collected, and a review of previous asbestos reports, the materials listed below were identified to contain asbestos.

Material Description	Material Location	% and Type Asbestos	Estimated Quantity**
Black Tar	Seams on Top of Parapet Walls on Roof of Building 33	5% Chrysotile	100 Square Feet (SF)
Roof Flashing*	Roof of Building 33	7-9% Chrysotile	375 SF
Roof*	Roof of Building 33	7-9% Chrysotile	5,600 SF
Exterior Window Caulking	Maintenance Garage Windows	<1% Chrysotile	10 SF or 5 Windows

* Material indicated positive by laboratory analysis in prior asbestos reports.

**Estimated quantities listed above are based on a cursory field evaluation, and actual quantities may vary significantly, especially if ACMs are present in hidden and/or inaccessible areas not evaluated as part of this survey. This is not a bidding document and contractors would be responsible for drawing their own conclusions on quantities present.

Asbestos was not identified in the samples collected from the shed structure.

A summary of the identified ACMs is also included in Appendix A. A sample and results summary is included in Appendix B, and laboratory analytical reports are included in Appendix C. A photo

log showing examples of the identified ACM is included as Appendix E. Prior asbestos reports are included as Appendix G (Client-Provided Information).

If the above identified ACMs will be impacted by renovation, or if the two structures with ACM will be demolished, the ACMs will need to be taken into consideration for proper compliance with federal and, state EPA NESHAP regulations, Occupational Safety and Health Administration (OSHA) asbestos regulations, and local asbestos regulations.

ASBESTOS SURVEY
Three Structures
West Virginia State Capitol Complex
321 Michigan Avenue
Charleston, West Virginia 25305

Terracon Project No. N2207016

June 8, 2020

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) conducted an asbestos survey of three structures (Building 33, a maintenance garage, and a storage shed) at the West Virginia State Capitol Complex located at 321 Michigan Avenue in Charleston, West Virginia. The survey was conducted on May 27, 2019 by United States Environmental Protection Agency (USEPA)-accredited and state of West Virginia licensed asbestos inspectors in general accordance with Terracon proposal number PN4197167, dated September 10, 2019. Accessible interior and exterior building components were surveyed. Homogeneous areas of suspect asbestos-containing materials (ACM) were visually identified and documented. Although reasonable effort was made to survey accessible suspect materials, additional suspect but un-sampled materials could be located in walls, in voids, or in other concealed areas. Suspect ACM samples were collected in general accordance with the sampling protocols outlined in (USEPA) 40 Code of Federal Regulations (CFR) Part 763, Subpart E, known as the Asbestos Hazard Emergency Response Act (AHERA). Samples were delivered to an accredited laboratory for analysis by Polarized Light Microscopy (PLM).

Previous asbestos reports for the subject buildings were provided by the Client to Terracon for review prior to the field survey. Pertinent information from the previous reports was utilized where feasible in conjunction with our current survey (e.g. Terracon did not re-collect samples of suspect ACMs which had been previously confirmed by laboratory analysis to contain asbestos). A copy of previous reports is included in Appendix G (Client-Provided Information).

1.1 Project Objective

We understand that this survey was requested for the purpose of a planned renovation or demolition of the three subject structures referenced above. Asbestos surveys are required prior to renovation and demolition to satisfy requirements of the USEPA 40 CFR Part 61, Subpart M, the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation (as well as the state NESHAP equivalent).

1.2 Reliance

This report is for the exclusive use of The Chapman Technical Group (Client) for the project being discussed. Reliance by any other party on this report is prohibited without written authorization of Terracon and the Client. Reliance on this report by The Chapman Technical Group and all authorized parties will be subject to the terms, conditions, and limitations stated in the proposal, this report, and the agreement between the Client and Terracon.

2.0 BUILDING DESCRIPTION

The three structures located at the West Virginia State Capitol Complex included a single story mail building (Building 33), a maintenance garage, and a storage shed. Building 33 is a 5,600 square foot slab-on-grade structure with concrete masonry unit (CMU) block walls and a flat wood roof deck with asphalt roofing materials. The maintenance garage structure consists of approximately 950 square feet of interior floor space with metal walls and a sloped metal roof. The storage shed consists of approximately 50 square feet of interior floor space with CMU block walls and a sloped asphalt shingled roof.

3.0 FIELD ACTIVITIES

The survey was conducted by Mr. Lemuel Weyer and Mr. Joshua Vogel, EPA AHERA-accredited and state of West Virginia licensed asbestos inspectors. A copy of Mr. Weyer's and Mr. Vogel's West Virginia asbestos inspector license is attached as Appendix D. The survey was conducted in general accordance with the sample collection protocols established in USEPA 40 CFR Part 763, Subpart E, 763.86, AHERA. A summary of survey activities is provided below.

3.1 Visual Assessment

Survey activities were initiated with visual observation of the accessible interior and exterior areas of the facility to identify homogeneous areas of suspect ACM. A homogeneous area (HA) consists of building materials that appear similar throughout in terms of color and texture with consideration given to the date of application. Additionally, the prior asbestos survey reports were utilized to locate previously identified ACMs.

3.2 Physical Assessment

A physical assessment of each HA of suspect ACM was conducted to assess the friability and condition of the materials. A friable material is defined by the USEPA as a material which can be crumbled, pulverized, or reduced to powder by hand pressure when dry. Friability was assessed by physically touching suspect materials.

3.3 Sample Collection

Based on results of the visual observation, bulk samples of suspect ACM were collected in general accordance with USEPA AHERA sampling protocols. Samples of suspect materials were collected from randomly selected locations in each homogeneous area. Bulk samples were collected using wet methods as applicable to reduce the potential for fiber release. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker.

The selection of sample locations and frequency of sampling were based on Terracon's observations and the assumption that like materials in the same area are homogeneous in content. Previously identified ACMs, indicated in the Client-provided reports included in Appendix G, were not re-sampled.

Terracon collected a total of 62 bulk samples from 18 homogeneous areas of suspect ACM. A summary of suspect ACM samples collected during the survey is included as Appendix B.

3.4 Sample Analysis

Bulk samples were submitted under chain of custody to EMSL Analytical Inc. (EMSL) in Indianapolis, Indiana for analysis by PLM with dispersion staining techniques per USEPA methodology 600/R-93/116. The percentage of asbestos, where applicable, was determined by microscopic visual estimation. EMSL is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP), accreditation number 200188-0. When applicable for friable material samples identified by PLM to have a low asbestos-content (typically 5% or less), the additional point count method (400 points) was utilized for a more accurate quantification. EMSL is also licensed through the state of West Virginia, Bureau of Public Health as an asbestos and bulk sample analytical laboratory, license number LT000628.

The asbestos analytical report data is included in Appendix C.

4.0 REGULATORY OVERVIEW

The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. It also requires the identification and classification of existing materials prior to demolition or renovation activity. Under NESHAP, ACM are classified as either friable, Category I non-friable or Category II non-friable ACM. Friable materials are those that, when dry, may be crumbled, pulverized or reduced to powder by hand pressure. Category I non-friable ACM includes packings, gaskets, resilient floor coverings and asphalt roofing products containing more than 1% asbestos. Category II non-friable ACM are any materials other than Category I materials that contain more than 1% asbestos.

Friable ACM, Category I and Category II non-friable ACM which is in poor condition and has become friable or which will be subjected to drilling, sanding, grinding, cutting or abrading and which could be crushed or pulverized during anticipated renovation or demolition activities are considered regulated ACM (RACM).

In the state of West Virginia, asbestos activities are regulated by the Office of Environmental Health Services (OEHS) under the West Virginia Department of Health and Human Resources (DHHR). DHHR requires that any asbestos-related activity conducted in a public building be performed by personnel licensed by the DHHR OEHS. Asbestos abatement must be performed by DHHR OEHS-licensed asbestos abatement contractors.

RACM must be removed prior to renovation or demolition activities which will disturb the materials. The owner or operator must provide the DHHR OEHS with written notification of planned removal activities at least 10 working days prior to the commencement of asbestos abatement activities. Please note that the 10 working day notice is also applicable for building demolition, regardless of the presence or lack of ACM. Removal of RACM must be conducted by a State of West Virginia-licensed asbestos abatement contractor.

The OSHA Asbestos standard for construction (29 CFR 1926.1101) regulates workplace exposure to asbestos. The OSHA standard requires that employee exposure to airborne asbestos fibers be maintained below 0.1 asbestos fibers per cubic centimeter of air (0.1 f/cc). The OSHA standard classifies construction and maintenance activities which could disturb ACM, and specifies work practices and precautions which employers must follow when engaging in each class of regulated work. States which administer their own federally-approved state OSHA programs may require additional precautions.

5.0 FINDINGS AND RECOMMENDATIONS

Based on the results of laboratory analysis in regard to the samples collected, and a review of previous asbestos reports, the materials listed below were identified to contain asbestos.

Material Description	Material Location	% and Type Asbestos	Estimated Quantity**
Black Tar	Seams on Top of Parapet Walls on Roof of Building 33	5% Chrysotile	100 Square Feet (SF)
Roof Flashing*	Roof of Building 33	7-9% Chrysotile	375 SF
Roof*	Roof of Building 33	7-9% Chrysotile	5,600 SF
Exterior Window Caulking	Maintenance Garage Windows	<1% Chrysotile	10 SF or 5 Windows

* Material indicated positive by laboratory analysis in prior asbestos reports.

**Estimated quantities listed above are based on a cursory field evaluation, and actual quantities may vary significantly, especially if ACMs are present in hidden and/or inaccessible areas not

evaluated as part of this survey. This is not a bidding document and contractors would be responsible for drawing their own conclusions on quantities present.

Asbestos was not identified in the samples collected from the shed structure.

A summary of the identified ACMs is also included in Appendix A. A sample and results summary is included in Appendix B, and laboratory analytical reports are included in Appendix C. A photo log showing examples of the identified ACM is included as Appendix E. Prior asbestos reports are included as Appendix G (Client-Provided Information).

If the above identified ACMs will be impacted by renovation, or if the two structures with ACM will be demolished, the ACMs will need to be taken into consideration for proper compliance with federal and, state EPA NESHAP regulations, Occupational Safety and Health Administration (OSHA) asbestos regulations, and local asbestos regulations.

6.0 LIMITATIONS/GENERAL COMMENTS

In addition to any limitations indicated in other sections of this report, Terracon did not perform sampling which required demolition or destructive activities such as knocking large holes in walls, dismantling of equipment or removal of protective coverings. Reasonable efforts to access suspect materials within known areas of restricted access (e.g., crawl spaces) were made; however, confined spaces or areas which may pose a health or safety risk to Terracon personnel were not sampled. Sampling did not include suspect materials which could not be safely reached with available ladders/man-lifts.

This asbestos survey was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our survey of the building. The information contained in this report is relevant to the date on which this survey was performed, and should not be relied upon to represent conditions at a later date. This report has been prepared on behalf of and exclusively for use by The Chapman Technical Group for specific application to their project as discussed. This report is not a bidding document. Contractors or consultants reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories, or other third-parties supplying information which may have been used in the preparation of this report. No warranty, express or implied is made.

APPENDIX A

Three Structures
West Virginia State Capitol Complex
321 Michigan Avenue
Charleston, West Virginia 25305
June 8, 2020

IDENTIFIED ASBESTOS-CONTAINING MATERIALS BY HOMOGENEOUS AREA (HA)

HA No.	Material Description	Material Location	% and Type Asbestos	EPA NESHAP Classification	Condition	Estimated Quantity*
13	Black Tar	Seams on Top of Parapet Walls on Roof of Building 33	5% Chrysotile	Category I Non-Friable	Good	100 Square Feet (SF)
16	Exterior Window Caulking	Maintenance Garage Windows	<1% Chrysotile	Not Regulated by EPA NESHAP (<1%) – Regulated by OSHA	Good	10 SF or 5 Windows
-	Roof Flashing	Roof of Building 33	7-9% Chrysotile	Category I Non-Friable	Good	375 SF
-	Roof	Roof of Building 33	7-9% Chrysotile	Category I Non-Friable	Good	5,600 SF

***Estimated quantities** are based on a cursory field evaluation, and actual quantities may vary significantly, especially if ACMs are present in hidden and/or inaccessible areas not evaluated as part of this survey. This is not a bidding document and contractors would be responsible for drawing their own conclusions on quantities present.

The materials listed in this table have been sampled and determined to contain asbestos. When disturbed, various federal, state and local regulations apply. If to be left in place, and in good condition, these materials should be monitored for damage over time and repaired as necessary by appropriately trained personnel. Removal may be necessary for materials if in poor condition (an airborne exposure concern), before renovations, and in most cases before a demolition. See Appendix B for a summary of samples collected. See Appendix C for detailed analytical results.

APPENDIX B

Project: Three Structures
West Virginia State Capitol Complex
321 Michigan Avenue
Charleston, West Virginia 25305
June 8, 2020

ASBESTOS SURVEY SAMPLE SUMMARY

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
1	01	2'x4' Small Fissure Ceiling Tile	Entry to Warehouse	Throughout Building 33	None Detected (ND)
	02		Doorway to Lobby		ND
	03		Near Doorway to Garage Area		ND
2	04	12"x12" White Floor Tile with Yellow Mastic	Southwest Corner of Lobby	Lobby, IT Room and Breakroom in Building 33	Floor Tile: ND Mastic: ND
	05		Middle North Wall of IT Room		Floor Tile: ND Mastic: ND
	06		Northwest Corner of Breakroom		Floor Tile: ND Mastic: ND
3	07	4" Tan Cove Base with Tan Mastic	Southwest Corner of Lobby	South Wall of West Restroom of Building 33	Cove Base: ND Mastic: ND
	08		Southeast Corner of Lobby		Cove Base: ND Mastic: ND
	09		Northwest Corner of Breakroom		Cove Base: ND Mastic: ND
4	10	Plaster Walls: Base Coat and Finished Coat	Southwest Corner	Restrooms of Building 33	Finished Coat: ND Base Coat: ND
	11		Middle of South Wall		Finished Coat: ND Base Coat: ND
	12		Southeast Corner		Finished Coat: ND Base Coat: ND

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
5	13	1'x1' Ceiling Tile on Track	Middle East Wall of East Restroom	South Wall of West Restroom of Building 33	ND
	14		Middle of South Wall		ND
	15		Southeast Corner		ND
6	16	Transparent Caulking	East Sink	Around Sinks in West Restroom of Building 33	ND
	17		West Sink		ND
	18		West Sink		ND
7	19	Brown Glue Dots Beneath Styrofoam Panels	Southeast Corner	Storage Room of Building 33 on Ceiling	ND
	20		Southeast Corner		ND
	21		Southeast Corner		ND
8	22	Drywall System: Drywall and Joint Compound	At Attic Hatch	Throughout Building 33	Drywall: ND Joint Compound: ND
	23		Northeast Corner of Hallway near Restroom		Drywall: ND Joint Compound: ND
	24		Near Lobby Entrance from Main Room		Drywall: ND Joint Compound: ND
	25		Southeast Corner of Breakroom		Drywall: ND Joint Compound: ND
	26		Northeast Corner of Lobby		Drywall: ND Joint Compound: ND
	27		Southeast Corner of Garage		Drywall: ND Joint Compound: ND
	28		Near Entrance Door to Main Room from Garage		Drywall: ND Joint Compound: ND

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
9	29	2'x4' Ceiling Tile with Large Fissures	Southeast Corner	Storage Room of Building 33	ND
	30		Northeast Corner		ND
	31		Northwest Corner		ND
10	32	Textured Walls	Southeast Corner of Lobby	Throughout Building 33	ND
	33		Southwest Corner of Lobby		ND
	34		East End of Hallway to Restrooms		ND
	35		Middle South Wall of Hallway Restrooms		ND
	36		Southeast Corner of IT Closets		ND
	37		Southwest Corner of Breakroom		ND
	38		Northeast Corner of Breakroom		ND
11	39	Tan Exterior Expansion Caulking	Southwest Expansion Joint	Southwest Exterior Expansion Joint of Building 33	ND
	40		Southwest Expansion Joint		ND
	41		Southwest Expansion Joint		ND
12	42	Grey Caulking	Southwest Corner of Building	Around 6" Electrical Conduits @ Southwest Corner of Building 33	ND
	43		Southwest Corner of Building		ND
	44		Southwest Corner of Building		ND

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
13	**45**	**Black Tar**	**Middle of South Wall**	**Seams on Top of Parapet Wall on Roof of Building 33**	**5% Chrysotile**
	46		**Southeast Corner**		**5% Chrysotile**
	47		**Northwest Corner**		**5% Chrysotile**
14	48	White Floor Expansion Caulking	Middle North End	Seams in Maintenance Garage Floor	ND
	49		Center of Building		ND
	50		Middle South End		ND
15	51	White Interior Window Glazing	Northeast Window	Maintenance Garage Windows	ND
	52		Middle North Window		ND
	53		West Side North Window		ND
16	**54**	**Exterior Grey Window Caulking**	**West Side – South Window**	**Maintenance Garage Windows**	**<1% Chrysotile**
	55		**North Side – Northwest Window**		**<1% Chrysotile**
	56		**North Side – Northeast Window**		**<1% Chrysotile**
17	57	Black Asphalt Shingles with Tar Paper (Multiple Layers)	Northwest Corner	Shed Roof	Shingles: ND Tar Paper: ND
	58		Southwest Corner		Shingles: ND Tar Paper: ND
	59		Northeast Corner		Shingles: ND Tar Paper: ND
18	60	Textured Paint	Northeast Corner		ND

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
	61		Northwest Corner	Exterior Shed Wall on CMU Block	ND
	62		Southwest Corner		ND

APPENDIX C

ASBESTOS ANALYTICAL LABORATORY DATA

EMSL Analytical, Inc.

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http://www.EMSL.com / indianapolislab@emsl.com

EMSL Order:	162010401
Customer ID:	HCNU50
Customer PO:	N4197168
Project ID:	

Attention:	Josh Vogel	**Phone:**	(513) 321-5816
	Terracon Consultants, Inc.	**Fax:**	(513) 321-0294
	611 Lunken Park Drive	**Received Date:**	05/29/2020 9:41 AM
	Cincinnati, OH 45226	**Analysis Date:**	06/03/2020 - 06/04/2020
		Collected Date:	
Project:	N4197168-W.V State Capitol Complex		

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1-1 *162010401-0001*	2x4 Small Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
1-2 *162010401-0002*	2x4 Small Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
1-3 *162010401-0003*	2x4 Small Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
2-4-Floor Tile *162010401-0004*	12x12 White Floor Tile with Yellow Mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2-4-Mastic *162010401-0004A*	12x12 White Floor Tile with Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2-5-Floor Tile *162010401-0005*	12x12 White Floor Tile with Yellow Mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2-5-Mastic *162010401-0005A*	12x12 White Floor Tile with Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2-6-Floor Tile *162010401-0006*	12x12 White Floor Tile with Yellow Mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
2-6-Mastic *162010401-0006A*	12x12 White Floor Tile with Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3-7-Cove Base *162010401-0007*	4" Tan Cove Base with Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3-7-Mastic *162010401-0007A*	4" Tan Cove Base with Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3-8-Cove Base *162010401-0008*	4" Tan Cove Base with Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3-8-Mastic *162010401-0008A*	4" Tan Cove Base with Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3-9-Cove Base *162010401-0009*	4" Tan Cove Base with Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3-9-Mastic *162010401-0009A*	4" Tan Cove Base with Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
4-10-Finish Coat *162010401-0010*	Plaster Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 162010401
Customer ID: HCNU50
Customer PO: N4197168
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4-10-Base Coat *162010401-0010A*	Plaster Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
4-11-Finish Coat *162010401-0011*	Plaster Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
4-11-Base Coat *162010401-0011A*	Plaster Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
4-12-Finish Coat *162010401-0012*	Plaster Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
4-12-Base Coat *162010401-0012A*	Plaster Walls	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
5-13 *162010401-0013*	1x1 Ceiling Tile	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
5-14 *162010401-0014*	1x1 Ceiling Tile	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
5-15 *162010401-0015*	1x1 Ceiling Tile	Gray Fibrous Homogeneous	95% Min. Wool	5% Non-fibrous (Other)	None Detected
6-16 *162010401-0016*	Transparent Caulking	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
6-17 *162010401-0017*	Transparent Caulking	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
6-18 *162010401-0018*	Transparent Caulking	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
7-19 *162010401-0019*	Brown Glue Dots Beneath Styrofoam Panels	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
7-20 *162010401-0020*	Brown Glue Dots Beneath Styrofoam Panels	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
7-21 *162010401-0021*	Brown Glue Dots Beneath Styrofoam Panels	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-22-Drywall *162010401-0022*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Heterogeneous	20% Cellulose 2% Glass	70% Gypsum 8% Non-fibrous (Other)	None Detected
8-22-Joint Compound *162010401-0022A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-22-Tape *162010401-0022B*	Drywall System: Drywall and Joint Compound	White Fibrous Homogeneous	98% Cellulose	2% Non-fibrous (Other)	None Detected
8-23-Drywall *162010401-0023*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Homogeneous	20% Cellulose 2% Glass	70% Gypsum 8% Non-fibrous (Other)	None Detected
8-23-Joint Compound *162010401-0023A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 162010401
Customer ID: HCNU50
Customer PO: N4197168
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
8-23-Tape *162010401-0023B*	Drywall System: Drywall and Joint Compound	White Fibrous Homogeneous	98% Cellulose	2% Non-fibrous (Other)	None Detected
8-24-Drywall *162010401-0024*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Heterogeneous	20% Cellulose 2% Glass	70% Gypsum 8% Non-fibrous (Other)	None Detected
8-24-Joint Compound *162010401-0024A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-25-Drywall *162010401-0025*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Heterogeneous	30% Cellulose	60% Gypsum 10% Non-fibrous (Other)	None Detected
8-25-Joint Compound *162010401-0025A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-25-Tape *162010401-0025B*	Drywall System: Drywall and Joint Compound	White Fibrous Homogeneous	50% Synthetic 40% Glass	10% Non-fibrous (Other)	None Detected
8-26-Drywall *162010401-0026*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Heterogeneous	50% Cellulose	40% Gypsum 10% Non-fibrous (Other)	None Detected
8-26-Joint Compound *162010401-0026A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-26-Tape *162010401-0026B*	Drywall System: Drywall and Joint Compound	White Fibrous Homogeneous	98% Cellulose	2% Non-fibrous (Other)	None Detected
8-27-Drywall *162010401-0027*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Heterogeneous	40% Cellulose 2% Glass	50% Gypsum 8% Non-fibrous (Other)	None Detected
8-27-Joint Compound *162010401-0027A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-27-Tape *162010401-0027B*	Drywall System: Drywall and Joint Compound				Layer Not Present
8-28-Drywall *162010401-0028*	Drywall System: Drywall and Joint Compound	Brown/White Fibrous Heterogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
8-28-Joint Compound *162010401-0028A*	Drywall System: Drywall and Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
8-28-Tape *162010401-0028B*	Drywall System: Drywall and Joint Compound				Layer Not Present
9-29 *162010401-0029*	2x4 Ceiling Tile with Large Fissures	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
9-30 *162010401-0030*	2x4 Ceiling Tile with Large Fissures	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
9-31 *162010401-0031*	2x4 Ceiling Tile with Large Fissures	Gray/White Fibrous Homogeneous	70% Cellulose 10% Min. Wool	15% Perlite 5% Non-fibrous (Other)	None Detected
10-32 *162010401-0032*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 162010401
Customer ID: HCNU50
Customer PO: N4197168
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
10-33 *162010401-0033*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10-34 *162010401-0034*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10-35 *162010401-0035*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10-36 *162010401-0036*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10-37 *162010401-0037*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10-38 *162010401-0038*	Textured Walls	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
11-39 *162010401-0039*	Tan Exterior Expansion Caulking	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
11-40 *162010401-0040*	Tan Exterior Expansion Caulking	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
11-41 *162010401-0041*	Tan Exterior Expansion Caulking	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
12-42 *162010401-0042*	Grey Caulking	Gray Non-Fibrous Homogeneous	7% Cellulose	93% Non-fibrous (Other)	None Detected
12-43 *162010401-0043*	Grey Caulking	Gray Non-Fibrous Homogeneous	7% Cellulose	93% Non-fibrous (Other)	None Detected
12-44 *162010401-0044*	Grey Caulking	Gray Non-Fibrous Homogeneous	7% Cellulose	93% Non-fibrous (Other)	None Detected
13-45 *162010401-0045*	Black Tar	Gray/Black Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
13-46 *162010401-0046*	Black Tar	Black Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
13-47 *162010401-0047*	Black Tar	Black Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
14-48 *162010401-0048*	White Floor Expansion Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
14-49 *162010401-0049*	White Floor Expansion Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
14-50 *162010401-0050*	White Floor Expansion Caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15-51 *162010401-0051*	White Interior Window Glazing	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 06/04/2020 10:56:45

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EMSL Order: 162010401
Customer ID: HCNU50
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Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
15-52 *162010401-0052*	White Interior Window Glazing	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15-53 *162010401-0053*	White Interior Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
16-54 *162010401-0054*	Exterior Grey Window Caulking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	<1% Chrysotile
16-55 *162010401-0055*	Exterior Grey Window Caulking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	<1% Chrysotile
16-56 *162010401-0056*	Exterior Grey Window Caulking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	<1% Chrysotile
17-57-Shingle *162010401-0057*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Heterogeneous	15% Glass	5% Quartz 80% Non-fibrous (Other)	None Detected
17-57-Shingle *162010401-0057A*	Black Asphalt Shingles wirth Tar Paper	Gray/Black Fibrous Homogeneous	30% Cellulose	2% Mica 68% Non-fibrous (Other)	None Detected
17-57-Tar Paper *162010401-0057B*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
17-58-Shingle *162010401-0058*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Heterogeneous	15% Glass	5% Quartz 80% Non-fibrous (Other)	None Detected
17-58-Shingle *162010401-0058A*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Heterogeneous	30% Cellulose	2% Mica 68% Non-fibrous (Other)	None Detected
17-58-Tar Paper *162010401-0058B*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
17-59-Shingle *162010401-0059*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Homogeneous	15% Glass	10% Quartz 75% Non-fibrous (Other)	None Detected
17-59-Shingle *162010401-0059A*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Homogeneous	30% Cellulose 10% Glass	60% Non-fibrous (Other)	None Detected
17-59-Tar Paper *162010401-0059B*	Black Asphalt Shingles wirth Tar Paper	Black Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
18-60 *162010401-0060*	Textured Paint	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18-61 *162010401-0061*	Textured Paint	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
18-62 *162010401-0062*	Textured Paint	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order:	162010401
Customer ID:	HCNU50
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Project ID:	

Analyst(s)
Crystal Oshurak (61)
Shannon Clegg (27)

Richard Harding, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Indianapolis, IN NVLAP Lab Code 200188-0, AZ0939, CA 2575, CO AL-15132, TX 300262

Initial report from: 06/04/2020 10:56:45

OrderID: 162010401

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*: 162010401

EMSL ANALYTICAL, INC.
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EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Company : Terracon Consultants - HCNU50		**EMSL-Bill to:** ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*	
Street: 611 Lunken Park Drive			
City: Cincinnati	**State/Province: OH**	**Zip/Postal Code: 45226**	**Country: USA**
Report To (Name): Josh Vogel		**Fax #:**	
Telephone #: 513-612-9002		**Email Address: joshua.vogel@terracon.com**	
Project Name/Number: N4197168 – W.V. State Capitol Complex			
Please Provide Results: ☐ Fax ☑ Email	**Purchase Order:** N4197168	**U.S. State Samples Taken:** WV	

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hours ☐ 6 Hours ☐ 24 Hrs ☐ 48 Hrs ☐ 3 Days ☐ 4 Days ☑ 5 Days ☐ 10 Days

**For TEM Air 3 hours/6 hours, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM - Air
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ EPA Protocol (Semi-Quantitative)
- ☐ EPA Protocol (Quantitative)

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Samplers Name: Lem Weyer **Samplers Signature:** Lem Weyer

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled

Client Sample # (s): - **Total # of Samples:** 2

Relinquished (Client): Lem Weyer **Date:** 5/28/20 **Time:**

Received (Lab): **Date:** **Time:**

Comments/Special Instructions:

RECEIVED
2020
EMSL ANALYTICAL, INC.
INDIANAPOLIS, IN

OrderID: 162010401

10401

SUSPECT ACM - BULK MATERIAL SAMPLE LOG

Date: 5/28/2020
Inspector: Josh Vogel & Lem Weyer
Project: West Virginia State Capitol Complex
Project # N4197168

Terracon
611 Lunken Park Drive
Cincinnati, Ohio 45226
(513) 321.5816

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
1	01	2'x4' Small Fissure Ceiling Tile	Entry to Warehouse	Throughout Building 33	
	02		Doorway to Lobby		
	03		Near Doorway to Garage Area		
2	04	12"x12" White Floor Tile with Yellow Mastic	Southwest Corner of Lobby	Lobby, IT Room and Breakroom in Building 33	
	05		Middle North Wall of IT Room		
	06		Northwest Corner of Breakroom		
3	07	4" Tan Cove Base with Tan Mastic	Southwest Corner of Lobby	Lobby, IT Room and Breakroom in Building 33	
	08		Southeast Corner of Lobby		
	09		Northwest Corner of Breakroom		
4	10	Plaster Walls	Southwest Corner	South Wall of West Restroom of Building 33	
	11		Middle of South Wall		
	12		Southeast Corner		
5	13	1'x1' Ceiling Tile	Middle East Wall of East Restroom	Restrooms of Building 33	
	14		Doorway of East Restroom		
	15		Middle North Wall of West Restroom		

10401

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
6	16	Transparent Caulking	East Sink	Around Sinks in West Restroom of Building 33	
	17		West Sink		
	18		West Sink		
7	19	Brown Glue Dots Beneath Styrofoam Panels	Southeast Corner	Storage Room of Building 33	
	20		Southeast Corner		
	21		Southeast Corner		
8	22	Drywall System: Drywall and Joint Compound	At Attic Hatch	Throughout Building 33	
	23		Northeast Corner of Hallway near Restroom		
	24		Near Lobby Entrance from Main Room		
	25		Southeast Corner of Breakroom		
	26		Northeast Corner of Lobby		
	27		Southeast Corner of Garage		
	28		Near Entrance Door to Main Room from Garage		
9	29	2'x4' Ceiling Tile with Large Fissures	Southeast Corner	Storage Room of Building 33	
	30		Northeast Corner		
	31		Northwest Corner		
10	32	Textured Walls	Southeast Corner of Lobby	Throughout Building 33	
	33		Southwest Corner of Lobby		

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
	34		East End of Hallway to Restrooms		
	35		Middle South Wall of Hallway to Restrooms		
	36		Southeast Corner of IT Closet		
	37		Southwest Corner of Breakroom		
	38		Northeast Corner of Breakroom		
11	39	Tan Exterior Expansion Caulking	Southwest Expansion Joint	Southwest Exterior Expansion Joint of Building 33	
	40		Southwest Expansion Joint		
	41		Southwest Expansion Joint		
12	42	Grey Caulking	Southwest Corner of Building	Around 6" Electrical Conduits @ Southwest Corner of Building 33	
	43		Southwest Corner of Building		
	44		Southwest Corner of Building		
13	45	Black Tar	Middle South Wall	Seams on Top of Metal Flashing on Roof of Building 33	
	46		Southeast Corner		
	47		Northwest Corner		
14	48	White Floor Expansion Caulking	Middle North	Seams in Maintenance Garage Floor	
	49		Center of Room		
	50		Middle South		
15	51	White Interior Window Glazing	Northeast Window	Maintenance Garage Windows	

Sample #		Sample Material Description	Sample Location	HA Location(s)	Results (% / Type of Asbestos)
HA #	SEQ. #				
	52		Middle North Window		
	53		West Side-North Window		
16	54	Exterior Grey Window Caulking	West Side- South Window	Maintenance Garage Windows	
	55		West Side – North Window		
	56		West Side- North Window		
17	57	Black Asphalt Shingles with Tar Paper	Northwest Corner	Shed Roof	
	58		Southwest Corner		
	59		Northeast Corner		
18	60	Textured Paint	Northeast Corner	Exterior Shed Wall on CMU Block	
	61		Northwest Corner		
	62		Southwest Corner		

APPENDIX D

LICENSES AND CERTIFICATIONS

WEST VIRGINIA

Asbestos Program

Joshua Vogel

IS LICENSED AS AN

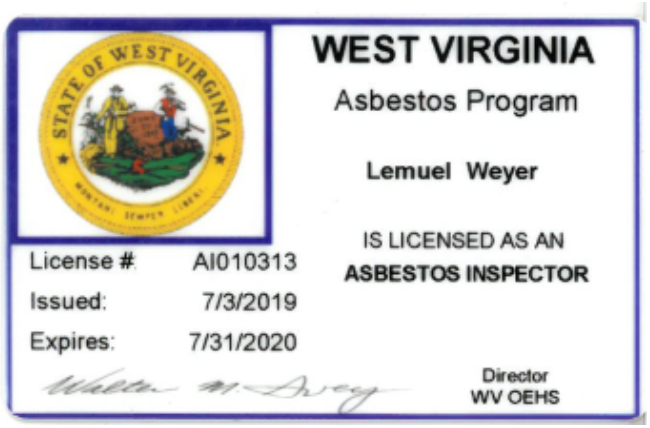
ASBESTOS INSPECTOR

License #: AI010539

Issued: 12/27/2019

Expires: 12/31/2020

Director
WV OEHS



WEST VIRGINIA

Asbestos Program

Lemuel Weyer

IS LICENSED AS AN

ASBESTOS INSPECTOR

License #: AI010313

Issued: 7/3/2019

Expires: 7/31/2020

Director
WV OEHS

APPENDIX E

PHOTOS



Photo #1 HA 13: Asbestos-Containing Black Tar on Top of Parapet Walls of Building 33



Photo #2 HA16: Asbestos-Containing (<1%) Exterior Window Caulking at the Maintenance Garage



Photo #3: Asbestos-Containing Roof Flashing of Building 33

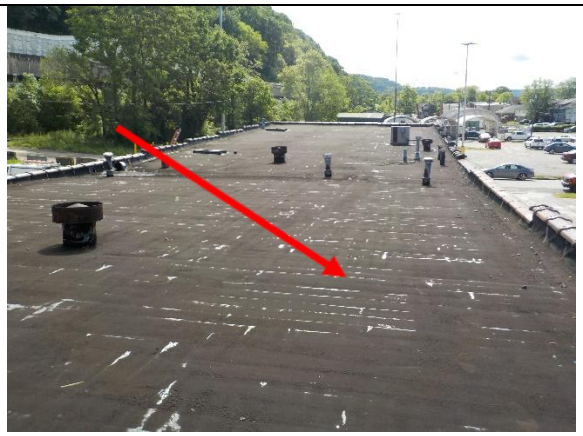
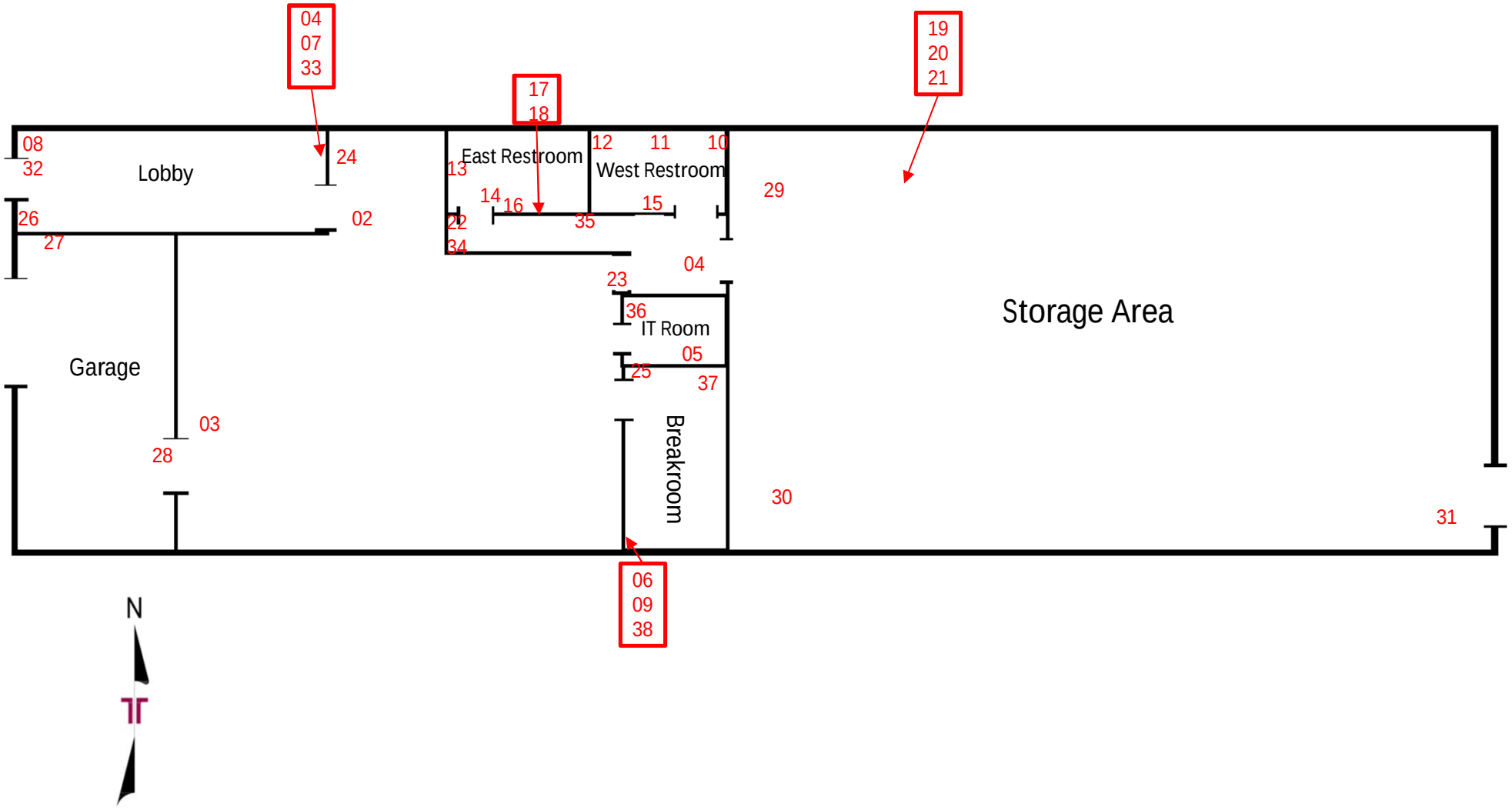


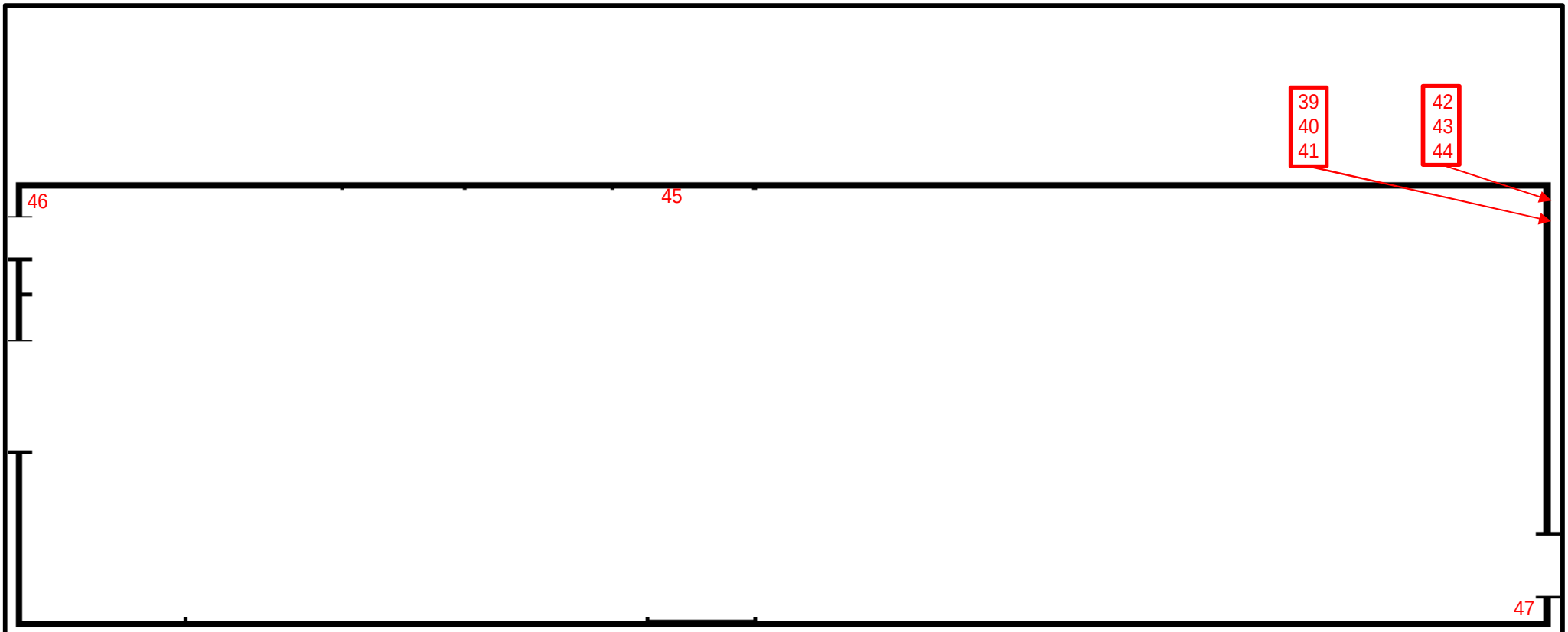
Photo #4: Asbestos-Containing Roof of Building 33

APPENDIX F

SAMPLE LOCATION DIAGRAMS

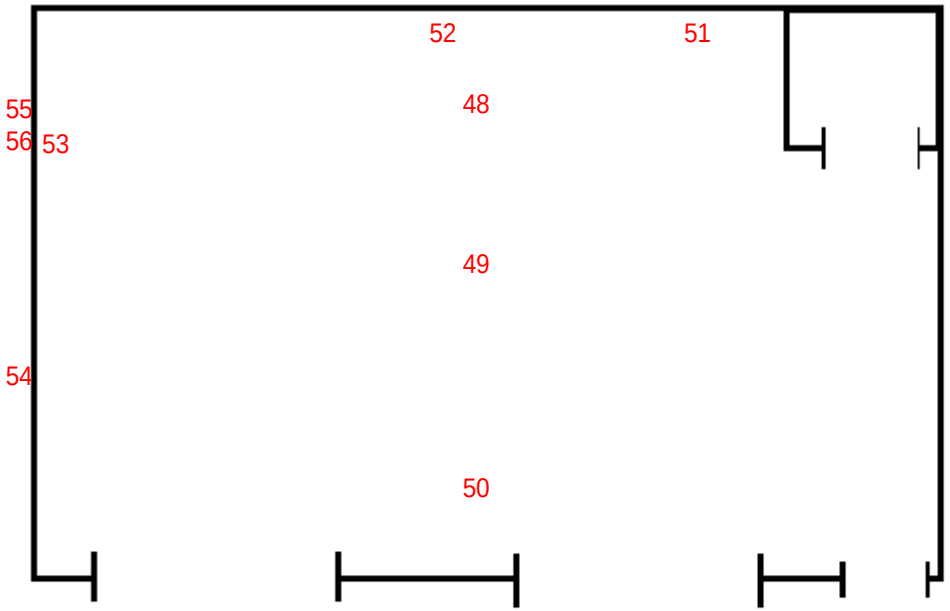


Project No. N2207016	Date: May 28, 2020	Terracon Consulting Engineers and Scientists	**Building 33 Interior**	**Exhibit**
Project Manager: Joshua Vogel			WV State Capitol Complex 321 Michigan Avenue Charleston, WV 25305	**1**
Location: Charleston, WV				
APR: Joe Tussey		611 Lunken Park Drive Cincinnati, Ohio 45226 PH. (513) 321-05816 FAX (513) 321-0294		

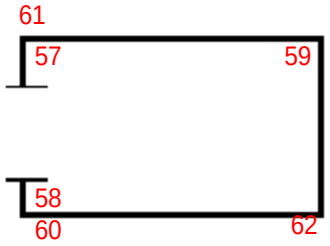




Project No. N2207016	Date: May 28, 2020	Terracon Consulting Engineers and Scientists	**Building 33 Exterior**	**Exhibit**
Project Manager: Joshua Vogel			WV State Capitol Complex 321 Michigan Avenue Charleston, WV 25305	**2**
Location: Charleston, WV		611 Lunken Park Drive Cincinnati, Ohio 45226 PH. (513) 321-05816 FAX (513) 321-0294		
APR: Joe Tussey				







Project No. N2207016	Date: May 28, 2020	Terracon Consulting Engineers and Scientists	**Maintenance Garage and Shed**	**Exhibit**
Project Manager: Joshua Vogel			WV State Capitol Complex 321 Michigan Avenue Charleston, WV 25305	**3**
Location: Charleston, WV		611 Lunken Park Drive Cincinnati, Ohio 45226 PH. (513) 321-05816 FAX (513) 321-0294		
APR: Joe Tussey				

APPENDIX G

CLIENT-PROVIDED INFORMATION

Bldg. 33
ASB Survey Complete
NO ASB SURVEY

Asbestos Survey

311 Jefferson Street
Charleston, WV 25305



Triad Environmental Consulting
2798 1st Avenue, Huntington, WV 25702
Phone (304) 523-2195 ▲ Fax (304) 523-2197

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

Tested for: State of WV General Services Division
103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 01 Homogeneous: Yes Color: White Lab No.: 152432
Location: Mail Room Foyer
Comments: Floor Tile

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 02 Homogeneous: Yes Color: Yellow Lab No.: 152433
Location: Mail Room Foyer
Comments: Glue

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 03 Homogeneous: Yes Color: Gray Lab No.: 152434
Location: Mail Room Foyer
Comments: Cove Molding

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

These results relate only to the samples included in this report.

Brian E. Galligan ME
Reviewed by Analyst

Brian E. Galligan ME
Manager, Asbestos Dept.

TEC participates in the American Industrial Hygiene Association's PAT Program and our laboratory identification number is 100935. Asbestos air sample analysis is performed using the NIOSH 7400 Method. Bulk analysis Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40CFR ch. 1 pt. 763 App. A to Subpt. F 7/1/87). This report shall not be reproduced except in full, without the written approval of the laboratory. Percentages are approximations; the detection limit for the PLM test method is 1%.

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Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 07	Homogeneous: Yes	Color: White	Lab No.: 152438
Location: Mail Room Foyer Wall			
Comments: Mud			
ASBESTOS		FIBROUS	OTHER MATERIALS
None Detected			Non-Fibrous 100%

Sample: 08	Homogeneous: Yes	Color: White	Lab No.: 152439
Location: Mail Room Foyer Ceiling			
Comments: Ceiling Tile			
ASBESTOS		FIBROUS	OTHER MATERIALS
None Detected		Cellulose 69 - 71 %	Non-Fibrous 29 - 31 %

Sample: 09	Homogeneous: Yes	Color: Gray	Lab No.: 152440
Location: Mail Room Breakroom			
Comments: Cove Molding			
ASBESTOS		FIBROUS	OTHER MATERIALS
None Detected			Non-Fibrous 100%

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103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 13 Homogeneous: Yes Color: White Lab No.: 152444
Location: Mail Room Breakroom
Comments: Mud

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 14 Homogeneous: Yes Color: White Lab No.: 152445
Location: Mail Room Breakroom
Comments: Floor Tile

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 15 Homogeneous: Yes Color: Yellow Lab No.: 152446
Location: Mail Room Breakroom
Comments: Glue

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

These results relate only to the samples included in this report.

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103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 19 Homogeneous: Yes Color: Clear Lab No.: 152450
Location: Mail Room Office
Comments: Glue

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 20 Homogeneous: Yes Color: White Lab No.: 152451
Location: Mail Room Womens Bathroom
Comments: Ceiling Tile

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Cellulose 69 - 71 %	Non-Fibrous 29 - 31 %

Sample: 21 Homogeneous: Yes Color: White Lab No.: 152452
Location: Mail Room Womens Bathroom exterior wall
Comments: Top Coat Plaster

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

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GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 25 Homogeneous: Yes Color: White Lab No.: 152456
Location: Mail Room Mens Bathroom exterior wall
Comments: Top Coat Plaster

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 26 Homogeneous: Yes Color: Gray Lab No.: 152457
Location: Mail Room Mens Bathroom exterior wall
Comments: Bottom Coat Plaster

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 27 Homogeneous: Yes Color: White Lab No.: 152458
Location: Mail Room hallway to Mens Bathroom wall
Comments: Drywall

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Cellulose 4 - 6 %	Non-Fibrous 94 - 96 %

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103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 31 Homogeneous: Yes Color: White Lab No.: 152462
Location: Mail Room Ceiling
Comments: Ceiling Tile

ASBESTOS	FIBROUS		OTHER MATERIALS	
None Detected	Cellulose	69 - 71 %	Non-Fibrous	29 - 31 %

Sample: 32 Homogeneous: Yes Color: White Lab No.: 152463
Location: Carpenters Shop Ceiling
Comments: Ceiling Tile

ASBESTOS	FIBROUS		OTHER MATERIALS	
None Detected	Cellulose	69 - 71 %	Non-Fibrous	29 - 31 %

Sample: 33 Homogeneous: Yes Color: Yellow Lab No.: 152464
Location: Carpenters Shop between interior & exterior wall
Comments: Insulation

ASBESTOS	FIBROUS		OTHER MATERIALS	
None Detected	Fibrous Glass	94 - 96 %	Non-Fibrous	4 - 6 %

These results relate only to the samples included in this report.

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103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 37 Homogeneous: Yes Color: Black Lab No.: 152468
Location: West Power Vent Flashing
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Synthetics 4 - 6 %	Non-Fibrous 94 - 96 %

Sample: 38 Homogeneous: Yes Color: Black Lab No.: 152469
Location: West Power Vent Flashing
Comments: Rolled

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Fibrous Glass 9 - 11 %	Non-Fibrous 89 - 91 %

Sample: 39 Homogeneous: Yes Color: Black Lab No.: 152470
Location: West Power Vent Flashing
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Synthetics 4 - 6 %	Non-Fibrous 94 - 96 %

These results relate only to the samples included in this report.

TEC participates in the American Industrial Hygiene Association's PAT Program and our laboratory identification number is 100935. Asbestos air sample analysis is performed using the NIOSH 7400 Method. Bulk analysis Method used: E.P.A Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40CFR ch. 1 pt. 763, App. A to Subpt. F 7/1/87) This report shall not be reproduced except in full, without the written approval of the laboratory. Percentages are approximations; the detection limit for the PLM test method is 1%

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103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 43 Homogeneous: Yes Color: Black Lab No.: 152474
Location: NE Corner Flashing
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
Chrysotile 7 - 9 %		Non-Fibrous 91 - 93 %

Sample: 44 Homogeneous: Yes Color: Black Lab No.: 152475
Location: NE Corner Flashing
Comments: Rolled

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Fibrous Glass 9 - 11 %	Non-Fibrous 89 - 91 %

Sample: 45 Homogeneous: Yes Color: Black Lab No.: 152476
Location: NE Corner Flashing
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
Chrysotile 7 - 9 %		Non-Fibrous 91 - 93 %

These results relate only to the samples included in this report.

TEC participates in the American Industrial Hygiene Association's PAT Program and our laboratory identification number is 100935. Asbestos air sample analysis is performed using the NIOSH 7400 Method Bulk analysis Method used: E.P.A Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40CFR ch. 1 pt 763, App. A to Subpt F 7/1/87) This report shall not be reproduced except in full, without the written approval of the laboratory Percentages are approximations; the detection limit for the PLM test method is 1%

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Phone (304) 523-2195 ▲ Fax (304) 523-2197

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

Tested for: State of WV General Services Division
103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 49 Homogeneous: Yes Color: Black Lab No.: 152480
Location: SE Corner Roof
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 50 Homogeneous: Yes Color: Black Lab No.: 152481
Location: SE Corner Roof
Comments: Felt

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Fibrous Glass 9 - 11 %	Non-Fibrous 89 - 91 %

Sample: 51 Homogeneous: Yes Color: Black Lab No.: 152482
Location: North Center Roof
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

These results relate only to the samples included in this report.

TEC participates in the American Industrial Hygiene Association's PAT Program and our laboratory identification number is 100935. Asbestos air sample analysis is performed using the NIOSH 7400 Method Bulk analysis Method used: E.P.A Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40CFR ch. 1 pt 763, App. A to Subpt F 7/1/87) This report shall not be reproduced except in full, without the written approval of the laboratory Percentages are approximations; the detection limit for the PLM test method is 1%

Triad Environmental Consulting

2798 1st Avenue, Huntington, WV 25702
Phone (304) 523-2195 ▲ Fax (304) 523-2197

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

Tested for: State of WV General Services Division
103 Michigan Avenue
Charleston, WV 25305
GSD1500000259
Report for: Jonathan Trout
Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 55 Homogeneous: Yes Color: Black Lab No.: 152486
Location: North Center Roof
Comments: Felt

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Fibrous Glass 9 - 11 %	Non-Fibrous 89 - 91 %

Sample: 56 Homogeneous: Yes Color: Black Lab No.: 152487
Location: West End Roof
Comments: Tar

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected		Non-Fibrous 100%

Sample: 57 Homogeneous: Yes Color: Black Lab No.: 152488
Location: West End Roof
Comments: Felt

ASBESTOS	FIBROUS	OTHER MATERIALS
None Detected	Fibrous Glass 9 - 11 %	Non-Fibrous 89 - 91 %

These results relate only to the samples included in this report.

TEC participates in the American Industrial Hygiene Association's PAT Program and our laboratory identification number is 100935. Asbestos air sample analysis is performed using the NIOSH 7400 Method. Bulk analysis Method used: E.P.A Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40CFR ch. 1 pt 763, App. A to Subpt. F 7/1/87) This report shall not be reproduced except in full, without the written approval of the laboratory Percentages are approximations; the detection limit for the PLM test method is 1%

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Job Location: 311 Jefferson St. Charleston, WV 25305
Method: PLM with Dispersion Staining

Project Number: 117-1503
Triad Report No: 15097

Date Received: 4/16/2015
Date Analyzed: 4/14/2015
Date Sampled: 1/28/2015
Analyst: Brian E. Galligan

Partial duplication strictly forbidden.

Sample: 61 Homogeneous: Yes Color: Black Lab No.: 152492
Location: North Center Roof Patch
Comments: Tar

ASBESTOS		FIBROUS	OTHER MATERIALS	
Chrysotile	7 - 9 %		Non-Fibrous	91 - 93 %

Sample: 62 Homogeneous: Yes Color: Black Lab No.: 152493
Location: South Center Vent
Comments: Tar

ASBESTOS		FIBROUS	OTHER MATERIALS	
Chrysotile	7 - 9 %		Non-Fibrous	91 - 93 %

These results relate only to the samples included in this report.

TEC participates in the American Industrial Hygiene Association's PAT Program and our laboratory identification number is 100935. Asbestos air sample analysis is performed using the NIOSH 7400 Method. Bulk analysis Method used: E.P.A Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40CFR ch. 1 pt 763, App. A to Subpt F 7/1/87) This report shall not be reproduced except in full, without the written approval of the laboratory Percentages are approximations; the detection limit for the PLM test method is 1%

TRIAD ENVIRONMENTAL CONSULTING, INC.

CORPORATE OFFICE ▲ 2798 1st Avenue ▲ Huntington, WV 25702

CHAIN OF CUSTODY RECORD

Sampler: Steve Adkins **Date:** 1-28-15

Laboratory Samples Shipped to: _____

Sample #	Location	Type	Analysis	Date
01	311 Jefferson Street	Bulk	PLM	1-28-15
	Charleston, WV			
62				

Relinquished by: (Sign)	Date/Time	Received by: (Sign)	Date/Time
Relinquished by: (Sign)	**Date/Time**	**Received by: (Sign)**	**Date/Time**
Relinquished by: (Sign)	**Date/Time**	**Received by: (Sign)**	**Date/Time**
Sample Disposition by:			

SOLVING THE ENVIRONMENTAL CONCERNS OF THE FUTURE, TODAY.

Triad Environmental Consulting, Inc.

Bulk Sample Log Sheet

Client Information:

State of WV
Jonny Trout

Phone – Fax – Cell: _____

Property Address:

311 Jefferson Street
Charleston, WV

Sample Number	*Friable (1-7) NF1 or NF2*	*Location*	*Material Type*	*Amount SQ / LF (Est.)*
01/02		Mail Room, Foyer, 12x12 White	FT/G	360
03/04		, ,	Cove/Glue	
05/06/07		, Wall	DW/T/M	
08		, Ceiling 2'x4' White	CT	
09/10		, Breakroom,	Cove/G	
11/12/13		, ,	DW/T/m	
14/15		, 12"x12" White	FT/G	144 Sq
16		, Above Drop Ceiling	Wall Board	
17		, ,	CT	
18/19		, Office	FT/G	72 Sq
20		, Womens Bathroom	CT	
21/22		, , Exterior Wall	TC/BC	
23		, Mens Bathroom	CT	
24		, ,	CT	
25/26		, , Exterior Wall	TC/BC	

CODES

AP= Acoustical Plaster	CG= Carpet Glue	DWM= Drywall Mud	FP= Fireproofing	M= Mastic	SP= Silver Paint
AT= Acoustical Tile	CLK= Caulking / Glazing	DWT= Drywall Tape	G= Glue	PF= Pipe Fitting Mud	T= Tar
BC= Bottom Coat Plaster	CP= Corrugated Paper Ins.	EX= Expansion Joint	Gas= Gasket	PI= Pipe Insulation	TC= Top Coat Plaster
BU= Built Up Roofing	DT= Duct Tape /Wrap	F= Felt Paper	GB= Gypsum Board	PW= Pipe Wrap	TP= Tar Paper
CT= Ceiling Tile	DW= Drywall	FT= Floor Tile	L= Linoleum	S= Shingles	TX= Texture Coat

Triad Environmental Consulting

Bulk Sample Log Sheet

Client Information:

_____

_____

_____

Phone – Fax – Cell: _____

Property Address:

_____

_____

Sample Number	*Friable (1-7) NF1 or NF2*	*Location*	*Material Type*	*Amount SQ / LF (Est.)*
34		N.E Corner Roof Cap	TAR	150 sq' Non Friable
35		South side Center Roof cap	TAR	"
36		N.West Corner Roof cap	TAR	"
37, 38, 39		West Power Vent Flashing	TAR, Roll, TAR	
40, 41, 42		~~West~~ South Center Flashing	TAR, Roll, TAR	11 5'8
43, 44, 45		N.E. Corner Flashing	TAR, Roll, TAR	"
46, 47, 48, 49, 50		S E Corner Roof	TAR, Felt, ins, TAR, Felt	
51, 52, 53, 54, 55		North center Roof	TAR, Felt, ins, TAR, Felt	
56, 57, 58, 59, 60		West End Roof	"	"
61		North Center Roof Patch	TAR	15' sq'
62		South Center VENT	TAR	100 sq'

CODES

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CT= Ceiling Tile	DW= Drywall	FT= Floor Tile	L= Linoleum	S= Shingles	TX= Texture Coat

Triad Environmental Consulting

Bulk Sample Log Sheet

Client Information:

_____

_____

_____

Phone – Fax – Cell: _____

Property Address:

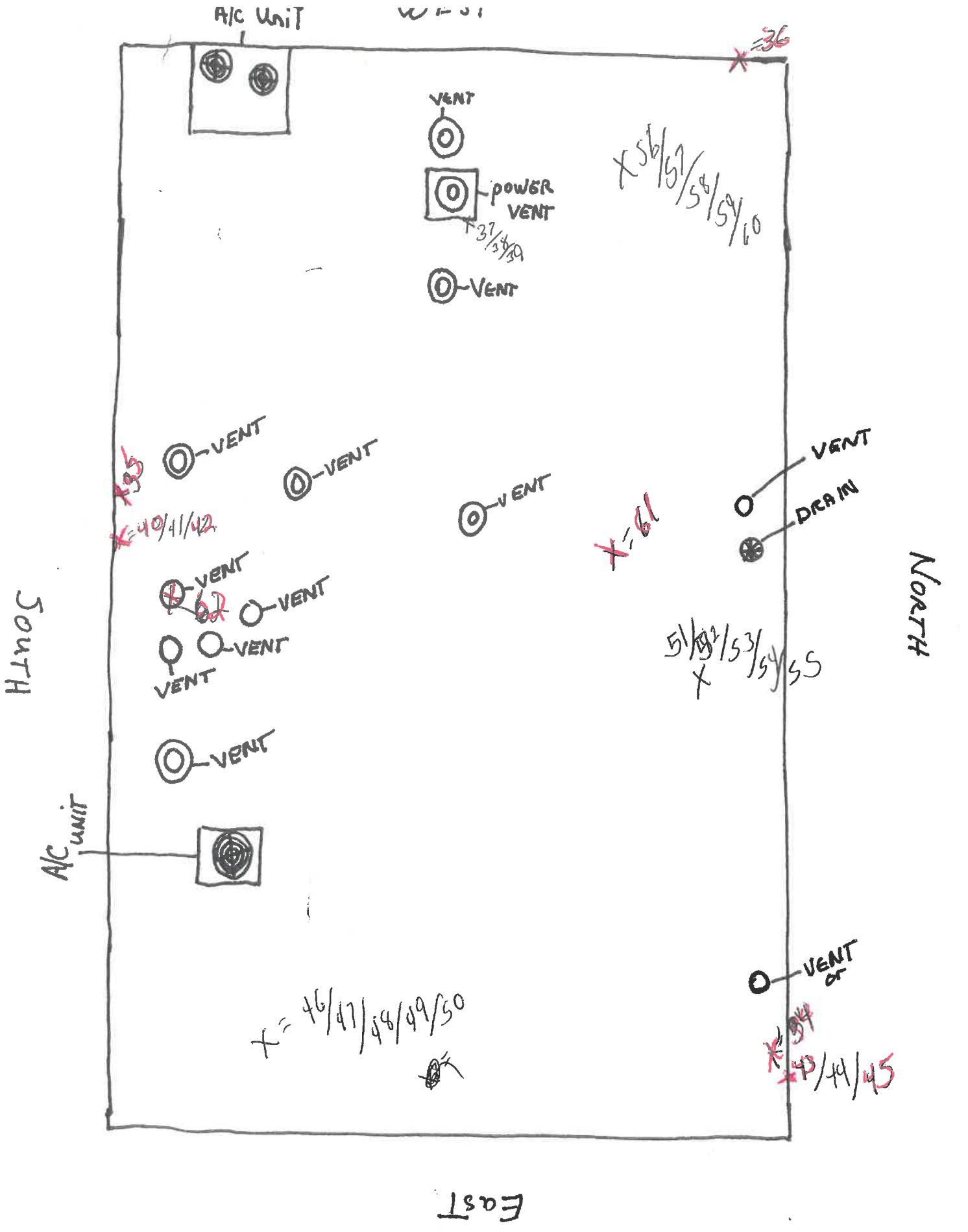
_____

_____

Sample Number	*Friable (1-7) NF1 or NF2*	*Location*	*Material Type*	*Amount SQ / LF (Est.)*
27/28/29/30		Mailroom, Hallway to Mens Bathroom, Wall	DW/T/M/Texture	
31		↓ , Ceiling	CT	
32		Carpenters Shop, Ceiling	↓	
33		, Between Interior & Exterior Wall	Insulation	

CODES

AP= Acoustical Plaster	CG= Carpet Glue	DWM= Drywall Mud	FP= Fireproofing	M= Mastic	SP= Silver Paint
AT= Acoustical Tile	CLK= Caulking / Glazing	DWT= Drywall Tape	G= Glue	PF= Pipe Fitting Mud	T= Tar
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CT= Ceiling Tile	DW= Drywall	FT= Floor Tile	L= Linoleum	S= Shingles	TX= Texture Coat


A/C Unit
VENT
POWER VENT
VENT
VENT
VENT
VENT
VENT
VENT
VENT
VENT
VENT
VENT
VENT
DRAIN
VENT
A/C UNIT
VENT
South
North
East

Building Summary Sheet

Date of Inspection: 1-28-15

Inspector: Steve Adkins License #: AI0078516

Client Information: State of WV GSD
103 Michigan Ave.
Charleston WV 25305
ATTN: Jonathan Trout

Building Address: 311 Jefferson Street
Charleston, WV 25305

Phone #: 304-957-7153 Other #'s: Jonathan.R.Trout@wv.gov

Scope of Work:

Complete ✓
Partial (Client Directed) _____ (see notes on back)

Reason for Survey:

Emergency Demo _____
Scheduled Demo _____
Renovation ✓

Type of Construction:

Frame _____ Masonry ✓ Steel Beam _____ Other _____

Floors: 1
Basement: No
Crawlspace: ↓
Pipe Shafts: ↓
Sheds/Barns: ↓

Attic: No
Roof: Built Up
Pipe Tunnels: No
Penthouse: ↓
Year of Construction: _____

Approximate Square Footage per Floor: 36 x 156

Approximate Total Square Footage: 5,616 ft²

Building History:

Current Use: Mail Room / Carpenters Shop
Past Use: ↓
Additions/Renovations: Mail Room

Exterior:

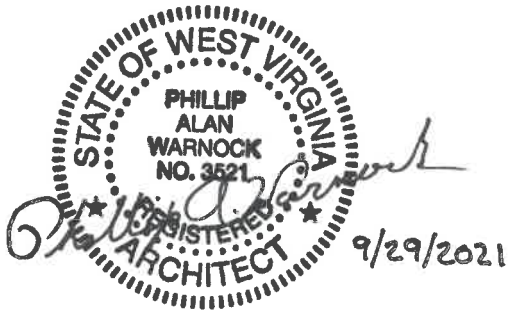
Vinyl _____ Metal _____ Brick ✓
Wood _____ Transite _____ Other _____

Chapman
Technical
Group
a division of
GRW

East Campus Project
Project Number GSD 773207

WV Department of Administration
General Services Division
Charleston, West Virginia

Project Manual
Volume I



200 Sixth Avenue
Saint Albans, WV 25177

304.727.5501
304.727.5580 Fax

Buckhannon, WV
Lexington, KY

www.chaptech.com

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VOLUME II

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End of Section

EAST CAMPUS PROJECT **19027**
WV DEPARTMENT OF ADMINISTRATION

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AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

19024 - Ritchie County Board of Education

The Architect:
(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

Init.
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EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

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[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

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§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

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§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

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[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

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Additions and Deletions Report for
AIA® Document A101™ – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Joseph E. Bird, Vice President, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 16:02:19 ET on 09/13/2019 under Order No. 4568032601 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A101™ – 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

WV State Capitol
East Campus Project

THE OWNER:
(Name, legal status and address)

WV General Services Division
112 California Avenue, Fifth Floor
Charleston, WV 25305

THE ARCHITECT:
(Name, legal status and address)

Chapman Technical Group
200 Sixth Avenue
Saint Albans, WV 25177

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

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§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

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§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

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delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely

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upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

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§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

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ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

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§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

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.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

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§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

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§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

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promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or

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expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

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§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance
The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss
§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work
§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work
§ 12.2.1 Before Substantial Completion
The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion
§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during

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that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

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§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

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§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;

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.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

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§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

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§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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State of West Virginia

Supplementary Conditions to AIA Document A201-2017
General Conditions of the Contract for Construction

The following Supplementary Conditions modify the General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

Order of Precedence: The documents contained in the contract to which this document has been attached shall be interpreted in the following order of precedence:

First Priority – Documents developed by the State or agency and utilized to provide public notice of the solicitation, along with other general terms and conditions shall be first in priority.

Second Priority – This document "Supplementary Conditions to the AIA Document A201-2017 General Conditions of the Contract for Construction" shall be second in priority.

Third Priority – all other AIA documents including, but not limited to, the AIA Document A201-2017 General Conditions of the Contract for Construction and the A101-2017 Standard Form of Agreement Between Owner and Contractor (when utilized) shall be third or lower in priority.

ARTICLE 1
GENERAL PROVISIONS

Add the following Section to Article 1:

§1.05 PARTY RELATIONS

§1.05 The Owner and their consultants, the Architect and their Consultants, and the Contractor and their Subcontractors agree to proceed with the Work on the basis of mutual trust, good faith and fair dealing.

§1.1 BASIC DEFINITIONS

§1.1.1 THE CONTRACT DOCUMENTS

§1.1.1 Delete the last sentence of this Section and substitute the following:

The Contract Documents also include the Bidding Documents (Advertisement or Invitation to Bid, Request for Quotations/Bids, Instructions to Bidders, Form of Proposal, Bid Bond and Sample Forms), Performance Bond, Payment Bond, Maintenance Bond (if applicable), Certificates of Insurance, Special Provisions For Disadvantaged and Women Business Enterprise Utilization (if bound herein).

§1.1.2 THE CONTRACT

§1.1.2 Make the following changes to Section 1.1.2:

In the last sentence, insert "and the Contractor" after "The Architect" and delete "the Architect's" and insert "their respective".

§1.2 Correlation and intent of Contract Documents

§1.2.1.1 In the second sentence, remove "any law" and insert "West Virginia law or any applicable federal law". In the last sentence, remove "by law" and insert "West Virginia law or any applicable federal law".

§1.7 Digital Data Use and Transmission

§1.7 Delete the last sentence of this section in its entirety.

§1.8 Building Information Models Use and Reliance

§ 1.8 Remove this section in its entirety and replace it with the following:

"Any use of, or reliance on, all or a portion of a building information model must be approved in advance by Owner and will only be permitted if the Parties have agreed upon and executed written documents to memorialize protocols governing the use of, and reliance on, the information contained in the model."

ARTICLE 2
OWNER

§2.1 GENERAL

§ 2.1.1 Add the following after the last sentence:

Notwithstanding the foregoing, the parties understand that since Owner is a government entity, change orders will often require approval by entities in addition to owner. When owner is a state agency, those entities may include, but are not limited to, the West Virginia Attorney General's Office and the West Virginia Purchasing Division. Additionally, approval may be required by agencies providing project funding, including but not limited to, West Virginia School Building Authority and agencies of the United States federal government.

§2.1.2 Delete Section 2.1.2 in its entirety.

§2.1 Add the following Section to 2.1:

§2.1.3 The Owner and the agency funding the project reserve the right to maintain a full time or part time project representative (sometimes referred to as the "Clerk of the Works") at the project site who shall keep the Owner informed of the progress and quality of the Work and responsibilities. The Contractor shall cooperate and assist the Clerk of the Works in the performance of his/her duties. The Clerk of the Works will not interfere with or be responsible for the Contractor's supervision and direction of the Work, and the Contractor's means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work. The Clerk of the Works may facilitate communications between the Owner, Architect, and Contractor but has no authority to make decisions for the Owner, approve modifications to the Contract Documents, the Contract Time, or Contract Sum. Additionally, Contractor is not permitted to rely on or consider decisions made by the Clerk of the Works on behalf of Owner

§2.2 Evidence of the Owner's Financial Arrangements: Delete § 2.2 and all of its subsections in its entirety.

§2.3 Information and Services Required of Owner

§2.3.2 Make the following changes to Section 2.3.2:

In first sentence, delete the period and add ", when required pursuant to West Virginia Code §30-12-1 et seq." Add the following sentence at the end of Section 2.3.2: "If the Owner does not retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located, the Owner will appoint an individual to assume the role and obligations of the Architect pursuant to this Agreement."

§2.3.3 Delete this section in its entirety.

§2.3.4 Delete the last sentence of Section 2.3.4 and substitute the following:

The Contractor shall confirm the locations of each utility. If the Owner has provided geotechnical and other tests to determine subsurface conditions, the Owner will provide such documents to the Contractor; the Contractor acknowledges that it will make no claims for any subsurface or any other conditions revealed by these tests.

ARTICLE 3
CONTRACTOR

§3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§3.2.2 Add the following sentence to the end of Section 3.2.2:

Claims by Contractor resulting from its failure to familiarize itself with the site shall be deemed waived. Additionally, by submitting a bid or otherwise entering into this contract, Contractor acknowledges that it has reviewed and understands the contract documents and the work required by those documents. Any claims arising from Contractor's failure to review and understand the contract documents shall be deemed waived.

§3.2.3 Delete Section 3.2.3 in its entirety and substitute the following:

§3.2.3 The Contractor acknowledges its continuing duty to review and evaluate the Construction Documents during performance of its services and shall immediately notify the Owner and the Architect about any problems, conflicts, defects, deficiencies, inconsistencies or omissions it discovers in or between the Construction Documents; and variances it discovers between the Construction Documents and applicable laws, statutes, building codes, rules and regulations.

§ 3.2.4 Add the following clauses to Section 3.2.4:

§3.2.4.1 If the Contractor performs any Work which it knows or should have known involves a recognized problem, conflict, defect, deficiency, inconsistency or omission in the Construction Documents; or a variance between the Construction Documents and requirements of applicable laws, statutes, building codes, rules and regulations, without notifying the Owner and the Architect prior to receiving written authorization from the Architect to proceed, the Contractor shall be responsible for the consequences of such performance.

§3.2.4.2 Before ordering any materials or doing any Work, the Contractor and Subcontractors shall verify all measurements at the site and shall be responsible for the correctness of same. Discrepancies shall be reported in writing to the Architect prior to proceeding with the Work. No extra charge or compensation will be

entertained due to differences between actual measurements and dimensions indicated on the drawings, if such differences do not result in a change in the scope of Work or if the Architect failed to receive written notice before the Work was performed.

§3.4 LABOR AND MATERIALS

§3.4.1 Vendor must review and comply with the following statutory requirements affecting public construction projects, as well as any other applicable laws that are not referenced herein:

- W. Va. Code § 5-19-1 et seq., relating to domestic steel preference.
- W. Va. Code § 5A-3-56 relating to domestic steel preference, provided that the Owner is a state agency subject to Chapter 5A, Article 3 of the W. Va. Code.
- W. Va. Code § §21-1C-1 *et seq.*, relating to local hiring preference
- W. Va. Code §21-1D-1 *et seq.*, relating to drug free workplace requirements.

§3.4 Add the following Sections to 3.4:

§3.4.4 Where materials and equipment are to be provided by the Owner under the Contract Documents, the Contractor shall notify the Owner in writing as to when materials and equipment are required on the project site in sufficient time to avoid delay in the Work.

§3.4.5 The Contractor shall employ labor on the Project or in connection with the Work, capable of working harmoniously with all trade crafts and any other individuals associated with the Project. The Contractor shall also use its best efforts and implement policies and practices to minimize the likelihood of any strike, work stoppage or other labor disturbance. Except as specifically provided in this Agreement, Contractor shall not be entitled to any adjustment in the Contract sum or Contract time and shall be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes by the work force of or provided by Contractor or its Subcontractors.

§3.5 WARRANTY

§3.5 Add the following sentence at the end of Section 3.5:

The Contractor agrees to assign to the Owner at time of Final Completion of the Work, any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such a manner so as to preserve any and all such warranties.

§3.8 ALLOWANCES

§3.8.3 Make the following change to Section 3.8.3:

§3.8.3 Delete "with reasonable promptness" and insert "in sufficient time to avoid delay in the Work."

Add the following Section to 3.8:

§3.8.4 The Contractor shall promptly submit to the Owner an itemized account of any expenditure by the Contractor of the Contract allowance in sufficient detail to allow the Owner to properly account for such expenditure.

§3.9 SUPERINTENDENT/PROJECT MANAGER

§3.9.1 Add the following sentence to the end of Section 3.9.1:

The Contractor may also employ a competent project manager.

§3.9.2 Make the following changes to Section 3.9.2:

In the first sentence, add "and project manager, if applicable" after "superintendent." In the second sentence, add "or project manager, if applicable," after "superintendent."

§3.9.3 Make the following changes to Section 3.9.3:

In the first sentence, add "or project manager, if applicable," after "superintendent." In the second sentence, add "or project manager, if applicable," after "superintendent."

§3.9 Add the following Section to 3.9:

§3.9.4 The Owner shall have the right, at any time, to direct a change in the Contractor's representatives if their performance is deemed unsatisfactory.

§3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§3.10.1 Make the following changes to Section 3.10.1:

In the first sentence, delete the word "promptly" and substitute "by the earliest reasonable date".

Add the following sentence to the end of Section 3.10.1: "The Contractor shall submit an updated construction schedule with each payment application, unless waived by the Owner."

Add the following Sections to 3.10:

§3.10.4 At any time after the first thirty (30) days of the Contract Time, if it is found that the project is two (2) weeks or more behind schedule, beyond approved time extensions, or if at any time during

the last thirty (30) days of the scheduled Contract Time the Contractor is one (1) week or more behind schedule, the Contractor shall immediately submit a plan to the Owner describing how the Work will be placed back on schedule within the remaining Contract Time.

§3.10.5 If the Owner and the Architect determine that the performance of the Work during any stage of the construction schedule last approved by the Owner has not progressed or reached the level of completion required by the Contract Documents, the Owner will have the right to order the Contractor to take corrective measures (hereinafter referred to collectively as Extraordinary Measures) necessary to expedite the progress of the Work, including, without limitation: (1) working additional shifts or overtime; (2) supplying additional manpower, equipment and facilities; and (3) other similar measures. Such Extraordinary Measures shall continue until the progress of the Work complies with the last approved construction schedule. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule after allowing for approved extensions of Contract Time as provided elsewhere in this Agreement. The Contractor is not entitled to an adjustment in the Contract Sum in connection with any Extraordinary Measures required by the Owner. The Owner may exercise its rights under this Section as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with the construction schedule.

§3.11 DOCUMENTS AND SAMPLES AT THE SITE

§3.11 Insert the following sentence at the end of Section 3.11:

The Contractor's compliance with this Section 3.11 shall be a condition precedent to any obligation of the Owner to make Final Payment pursuant to this Agreement.

§3.15 CLEANING UP

§3.15.2 Delete Section 3.15.2 in its entirety and substitute the following:

§3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and may withhold such reasonable costs as necessary for the fulfillment of the Contractor's obligation under this Section 3.15. If the reasonable costs of such cleaning exceed the Contract Sum then due the Contractor, the Contractor shall reimburse the Owner the difference within thirty (30) consecutive calendar days of the Owner's written request.

Any materials, tools, supplies, or other personal property left by the Contractor shall be deemed abandoned property and the Owner shall have no obligation to hold or store the property on behalf of Contractor and may dispose of the abandoned property as if it were property of the State of West Virginia. Provided however, that prior to treating property as abandoned and disposing of it, Owner must first provide Contractor with 10 days notice of its intent to do so. If any materials, tools, supplies or other personal property belong to a subcontractor, then Contractor is obligated to communicate this notice to its subcontractor immediately.

§3.15 Add the following Section to 3.15:

§3.15.3 In order to achieve Substantial Completion, as defined by Section 9.8, for any portion of the Work, the Contractor must have the area where the Work is located fully cleaned and all materials and/or debris removed from site. The Certificate of Substantial Completion will not be issued until the Contractor has met this obligation.

ARTICLE 4
ARCHITECT

§4.1 GENERAL

§4.2 ADMINISTRATION OF THE CONTRACT

§4.2 Make the following changes to Section 4.2:

§4.2.1 In the first sentence of Section 4.2.1 after the word Architect add ", unless otherwise indicated by the Owner,".

§4.2.2 In the first sentence of Section 4.2.2 strike the word "generally."

§4.2.3 In the first sentence of Section 4.2.3 strike the word "reasonably."

§4.2.5 Add the following sentence at the end of Section 4.2.5:

The Architect upon receipt of an Application for Payment from the Contractor shall either review and certify such amounts due for payment or return such Application for Payment to the Contractor for correction(s) within five (5) consecutive business days of receipt.

§4.2.7 Delete the first sentence of Section 4.2.7 and substitute the following:

The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Modify the second to last sentence by removing it in its entirety and replacing it with the following: The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures, unless the Architect has established the required construction means, methods, techniques, sequences, or procedures, or the Contract Documents require such approval.

§4.2.8 Make the following change to Section 4.2.8:

In the first sentence, after the word Architect add ", in consultation with the Owner,".

ARTICLE 5
SUBCONTRACTORS

§5.2 Award of Subcontracts and Other Contracts for Portions of Work

§5.2.1 Add the following sentence to Section 5.2.1.

This provision in no way limits the Contractor's legal obligations to report subcontractors and labor/material suppliers under W. Va. Code § 5-22-1(f) and obtain approval under W. Va. Code § 5-22-1(g) prior to any subcontractor substitution.

§5.4 Contingent Assignment of Subcontracts: This section is removed in its entirety and replaced with the following:

§5.4 Emergency Contracts with Subcontractors:

In the event that the general contractor fails to fulfill its contractual obligations and the performance bond has failed to provide an adequate remedy, Owner has the right to execute emergency contracts with subcontractors to ensure continuation of the work, provided that doing so is in compliance with the laws, rules, and procedures governing emergency contracting authority for Owner, and the emergency contract terms comply with all other applicable laws, rules, and procedures.

ARTICLE 7
CHANGES IN THE WORK

§7.1 General

§7.1.2. In Section 7.1.2. remove the word "alone" and insert "with approval by the Owner."

§7.2 CHANGE ORDERS

§7.2 Add the following Section to 7.2:

§7.2.2 A written Change Order as defined under 7.2.1 above constitutes a final settlement of all matters relating to the change in the Work which is the subject of the Change Order, including, but not limited to general conditions, all direct or indirect costs associated with such change and any and all adjustment to the Contract Sum and Contract Time. The parties also understand and agree that if Owner is a state agency, change orders may require approval by entities in addition to Owner. Those entities may include, but are not limited to, the West Virginia Purchasing Division, and the West Virginia Attorney General's Office. Owner and Contractor must discuss the change order approval requirements prior to executing this agreement.

Add the following section to § 7.2

§7.2.3. Allowance for Overhead and Profit: Contractor's overhead and profit for a change order issued under this Article included in the total cost to the Owner shall not exceed based on the following schedule:

.1 For the Contractor, for any Work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

.2 For the Contractor, for Work performed by the Contractor's Subcontractor, ten percent (10%) of the amount due the Subcontractor.

.3 For each Subcontractor or Sub-Subcontractor involved, for any Work performed by that Subcontractor's own forces, fifteen percent (15%) of the cost.

.4. For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, ten percent (10%) of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7. Estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Change Order work. Supervision above the level of working foremen (such as general foremen, superintendent, project manager, etc.) is considered to be included in the allowance for Overhead and Profit. Hand tools are defined as equipment with a value of $1,000 or less. For Contractor owned equipment, the "bare" equipment rental rates allowed to be used for pricing Change Order proposals shall be not more than the monthly rate listed in the most current publication of The AED Green Book divided by 176 to arrive at a maximum hourly rate to be applied to the hours the equipment is used performing the Change Order work.

.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, material, equipment and Subcontractors. Details to be submitted will include detailed line item estimates showing detailed materials quantity take-offs, material prices by item and related labor hour pricing information and extensions (by line item or by drawing as applicable.) Where major cost items are Subcontracts, they shall also be itemized as prescribed above. In no case will a change involving over $10,000 be approved without such an itemization.

.7 Local Business and Occupation Taxes, if applicable, shall be calculated on the cost of the Work, overhead and profit..

.8 Overhead and profit shall not be calculated on changes in the Work involving unit prices. Unit prices are to have overhead and profit included in the price quoted.

.9 Under no circumstances is Contractor permitted to charge for the passage of time (often referred to as general conditions or winter conditions) without an identified, itemized, and concretely provable cost borne by Contractor. Contractor has a duty to mitigate costs during a delay period to the fullest extent possible and Contractor will not be paid for costs that could have been mitigated. Calculating a daily delay rate without properly identifying, itemizing, and proving actual, unmitigateable costs, is prohibited. Contractor understands and accepts that it has the responsibility to prove that costs could not be mitigated prior to submitting a request for payment.

§7.3 CONSTRUCTION CHANGE DIRECTIVES

§7.3.4 Make the following change in Section 7.3.4:

In the fourth line of the first sentence, delete the words "an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount" and substitute "an allowance for overhead and profit in accordance with clauses 7.3.11.1 through 7.3.11.9 below."

§7.3.7 Delete the word "recorded" and replace it with "processed".

§7.3.9 Delete Section 7.3.9 in its entirety and substitute the following:

§7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment provided these amounts have been added to the Contract by Change Order and a purchase order has been issued for the Change Order.

§7.3.10 Add the following sentence to the end of Section 7.3.10:

The Parties will utilize their best efforts to issue a change order within 60 days of agreement being reached, but failure to do so will not give rise to grounds for contract cancellation, penalties, or any other cause of action.

Add the following Section to 7.3:

§7.3.11 In Section 7.3.7, the allowance for overhead and profit for a change directive issued under this Article included in the total cost to the Owner shall not exceed the following schedule:

.1 For the Contractor, for any Work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

.2 For the Contractor, for Work performed by the Contractor's Subcontractor, ten percent (10%) of the amount due the Subcontractor.

.3 For each Subcontractor or Sub-Subcontractor involved, for any Work performed by that Subcontractor's own forces, fifteen percent (15%) of the cost.

.4. For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, ten percent (10%) of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7. Estimated labor hours shall include hours only for those workmen and working foremen directly involved in performing the Change Order work. Supervision above the level of working foremen (such as general foremen, superintendent, project manager, etc.) is considered to be included in the allowance for Overhead and Profit. Hand tools are defined as equipment with a value of $1,000 or less. For Contractor owned equipment, the "bare" equipment rental rates allowed to be used for pricing Change Order proposals shall be not more than the monthly rate listed in the most current publication of The AED Green Book divided by 176 to arrive at a maximum hourly rate to be applied to the hours the equipment is used performing the Change Order work.

.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, material, equipment and Subcontractors. Details to be submitted will include detailed line item estimates showing detailed materials quantity take-offs, material prices by item and related labor hour pricing information and extensions (by line item or by drawing as applicable.) Where major cost items are Subcontracts, they shall also be itemized as prescribed above. In no case will a change involving over $10,000 be approved without such an itemization.

.7 Local Business and Occupation Taxes, if applicable, shall be calculated on the cost of the Work, overhead and profit.

.8 Overhead and profit shall not be calculated on changes in the Work involving unit prices. Unit prices are to have overhead and profit included in the price quoted.

.9 Under no circumstances is Contractor permitted to charge for the passage of time (often referred to as general conditions or winter conditions) without an identified, itemized, and concretely provable cost borne by Contractor. Contractor has a duty to mitigate costs during a delay period to the fullest extent possible and Contractor will not be paid for costs that could have been mitigated. Calculating a daily delay rate

without properly identifying, itemizing, and proving actual, unmitigateable costs, is prohibited. Contractor understands and accepts that it has the responsibility to prove that costs could not be mitigated prior to submitting a request for payment.

§7.4 Minor Changes in Work. Insert the following sentence at the end of section 7.4:

"Contractor may request that Architect provide written confirmation that Owner has agreed to the minor change, and if requested, Architect will provide it."

ARTICLE 8
TIME

§8.3 DELAYS AND EXTENSIONS OF TIME

§8.3.1 In the first sentence, delete "unusual delay in deliveries," and add "unmitigatable costs attributable to" before the words "adverse weather conditions."

ARTICLE 9
PAYMENTS AND COMPLETION

§9.1 Contract Sum

§9.1.2 Add the following sentence to the end of section 9.1.2:

"Any equitable adjustment of unit prices must be processed as a change order to the contract"

§9.2 SCHEDULE OF VALUES

§9.2 Make the following changes to Section 9.2:

In the first sentence add "and the Owner" after the first reference to the Architect. In the second sentence add "or the Owner" after Architect. Remove the last sentence in its entirety and replace it with the following:

"Any changes to the schedule of values shall be submitted to the Architect and the Owner and supported by such data to substantiate its accuracy as the Architect or owner may require. This schedule, unless objected to by the Architect or the Owner, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment."

§9.3 APPLICATIONS FOR PAYMENT

§9.3 Make the following changes to Section 9.3:

§9.3.1 In the first sentence add "and the Owner" after the first reference to the Architect and add "and other required documents" after the words "schedule of values."

§9.3.1.1 Delete clause 9.3.1.1 in its entirety and substitute the following:

§9.3.1.1 Such applications may include requests for payment on account of changes in the Work authorized by Construction Change Directives and Change Orders only after a purchase order has been issued for the Work affected.

§9.3.1 Add the following clauses to Section 9.3.1:

§9.3.1.3 Until the Work is fifty percent (50%) complete, the Owner will withhold as retainage 10% of the amount due the Contractor on account of progress payments. At the time the Work is fifty percent (50%) complete and thereafter, if the manner of completion of the Work and its progress are and remain satisfactory to the Owner and Architect, and in the absence of other good and sufficient reasons, the Architect will, on presentation by the Contractor of Consent of Surety, authorize any remaining partial payments to be paid in full.

§9.3.1.4 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Owner and Architect, if the Surety withholds its consent, or for other good and sufficient reasons.

§9.4 CERTIFICATES FOR PAYMENT

§9.4.1 After the phrase "in the full amount of the Application for Payment," insert the phrase "less any retainage withheld pursuant to section 9.3.1.3,".

§9.6 PROGRESS PAYMENTS

§9.6.7 Delete Section 9.6.7 in its entirety.

§9.6.8 Delete Section 9.6.8 in its entirety.

§9.7 FAILURE OF PAYMENT

§9.7 Make the following changes in Section 9.7:

In line two, change "seven days" to "sixty days." In line four, delete "binding dispute resolution" and substitute "the West Virginia Claims Commission"

§9.8 SUBSTANTIAL COMPLETION

§9.8.3 Add the following clause to Section 9.8.3:

If Architect is required to perform more than one inspection under this subsection, Contractor shall be responsible for paying the Owner for the cost of the additional inspection, which will be paid by Owner to Architect, at the hourly rate established in the contract between Owner and Architect.

§9.8.5 Add the following clause to Section 9.8.5:

§9.8.5.1 The payment of retainage shall be sufficient to increase the total payments to ninety-five percent (95%) for the Work or designated portion thereof being accepted as Substantially Complete, less any amounts as the Architect shall determine for any Work that is not complete, not in accordance with the Contract Documents, or for unsettled claims.

§9.10 FINAL COMPLETION AND FINAL PAYMENT

§9.10.1 Add the following to the end of Section 9.10.1:

If Architect is required to perform more than one inspection under this subsection, Contractor shall be responsible for paying the Owner for the cost of the additional inspection, which will be paid by Owner to Architect, at the hourly rate established in the contract between Owner and Architect.

§9.10.2 Make the following changes in Section 9.10.2:

In the first sentence, delete "for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner)."

Add the following clause to Section 9.10.2:

§9.10.2.1 Before final payment is due the Contractor, all applicable State and local taxes must be paid. If requested by the Owner, the Contractor shall present evidence that payment or satisfaction of all such tax obligations has been made.

§9.10.3 Add the following clause to Section 9.10.3:

9.10.3.1 Unless and to the extent final completion is delayed through no fault of the Contractor as provided in Section 9.10.3, the Owner shall be under no obligation to increase payments above ninety-five percent (95%) until final completion of the Work is Certified by the Architect.

§9.10.4 Make the following changes in Section 9.10.4:

In the first sentence, delete the word "the" and replace it with "Unless and until the Contractor makes a subsequent Claim against the Owner, the".

Add the following as the last sentence. "Neither the Owner's offer of a final payment nor its acceptance by the Contractor shall legally prevent or limit the Owner's right to assert any and all counterclaims in litigation filed by the Contractor as allowed in section 15.1.8."

Add the following Sections to Article 9:

§9.11 LIQUIDATED DAMAGES

§9.11.1 The Owner will suffer financial loss if the Work is not Substantially Complete within the Contract Time as defined in Article 8, and if final completion is not achieved within the specified time frame following Substantial Completion. As liquidated damages, and not as a penalty, the Contractor and the Contractor's surety shall be liable for and shall pay the Owner the sum(s) stated in this Agreement and/or purchase order.

§9.11.2 Allowances may be made for delays due to shortages of materials and/or energy resources, subject to proof by documentation, and also for delays due to strikes or other delays beyond the control of the Contractor. All delays and any claim for extension of Contract Time must be properly documented in accordance with Section 15.1.5 by the Contractor and must be made within the time limits stated in Section 15.1.2.

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

§10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

§10.2.8 Make the following changes to Section 10.2.8:

In the first sentence, delete "within a reasonable time not exceeding 21 days" and substitute "immediately".

§10.3 HAZARDOUS MATERIALS

§10.3.3 Delete Section 10.3.3 in its entirety.

ARTICLE 11
INSURANCE AND BONDS

§11.1 CONTRACTOR'S LIABILITY INSURANCE

§11.1.2 Add the following to the end of §11.1.2.

At a minimum the Contract shall provide, at the Contractor's Expense:

§11.1.2.1. a Performance Bond and a Labor and Material Payment Bond for 100% of the Contract Sum and, if applicable, a two-year roofing Maintenance Bond for the full value of the roofing system.

§11.1.2.2 An attorney-in-fact who executes the bonds on behalf of the surety shall affix thereto a certified and current copy of power of attorney.

§11.1.2.3 The bonds shall be issued on State of West Virginia forms. The Contractor shall deliver the required bonds and all other contract documents to the Owner not later than 15 days following receipt of the Owner's notice of intent to award a Contract.

§11.2 Owner's Insurance Delete section 11.2 in its entirety.

§11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

§11.4 Section 11.4 is deleted in its entirety.

§11.5.1 Make the following changes in Section 11.5.1:

In the first sentence, substitute "Contractor" for "Owner" each time the latter word appears.

§11.5.2 Delete Section 11.5.2 in its entirety and substitute the following:

§11.5.2 Prior to settlement of insured loss, the Contractor shall notify the parties of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The parties shall have 14 days from the receipt of notice to object. If no objection is made, the Contractor shall proceed as proposed and allocate the settlement accordingly. If such objection is made, the dispute shall be resolved as provided in Section 15.4. The Contractor, in that case, shall make settlement with insurers in accordance with directions of the Court. If distribution of the insurance proceeds as directed by the Court is required, the Court will direct such distribution. Any work to repair the damage will be incorporated into the contract as a change order.

ARTICLE 13
MISCELLANEOUS PROVISIONS

§13.4 TESTS AND INSPECTIONS

§13.4.1 Remove the phrase "so require" and insert in its place "prohibit delegation of the test to Contractor"

§13.6 INTEREST

§13.6 Delete Section 13.5 in its entirety and substitute the following:

Notwithstanding any other provision in the Contract Documents, West Virginia Code does not authorize the payment of interest on late payments. Accordingly, interest charges for late payment are prohibited.

Add the following Sections to Article 13:

§13.6 WORKERS COMPENSATION

The Contractor shall provide proof of compliance with West Virginia Worker's Compensation laws and regulations.

§13.7 CONTRACTOR'S LICENSE

§13.7.1 West Virginia Code §21-11-2 requires that all persons desiring to perform contractual work in West Virginia shall be duly licensed. The West Virginia Contractor's Licensing Board is empowered to issue a contractor's license.

§13.7.2 West Virginia Code §21-11-11 requires any prospective Bidder to include the Bidder's contractor's license number on its Bid. The successful Bidder will be required to furnish a copy of its contractor's license in a classification appropriate to the Work prior to issuance of a purchase order/contract.

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

§14.1 TERMINATION BY THE CONTRACTOR

§14.1.1 Make the following changes in Section 14.1.1:

At the end of clause 14.1.1.3 delete "; or" and insert a period.

Delete clause 14.1.1.4 in its entirety.

§14.1.3 Delete Section 14.1.3 in its entirety and substitute the following:

§14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exist, the Contractor may, upon seven days written notice to the Owner and Architect, terminate the Contract. In such event, the Contractor shall be paid for all Work performed in accordance with the Contract Documents, for reasonable and proven termination expenses and a reasonable allowance for overhead and profit. However, such payment, exclusive of termination expenses, shall not exceed the Contract Sum as reduced by other payments made to the Contractor and further reduced by the value of Work as yet not completed. The Contractor shall be entitled to reasonable overhead, but not profit, on Work not performed.

§14.2 TERMINATION BY THE OWNER FOR CAUSE

§14.2.4 Delete Section 14.2.4 in its entirety and substitute the following:

§14.2.4 If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other

damages incurred by the Owner and not expressly waived, such excess shall not be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Owner shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§14.4.1 Delete Section 14.4.1 in its entirety and substitute the following:

§14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause upon thirty days written notice.

§14.4.3 Delete Section 14.4.3 in its entirety and substitute the following:

§14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment from the Owner on the same basis provided in Section 14.1.3 above.

Add the following Section to Article 14:

§14.5 FISCAL YEAR FUNDING

§14.5 Work performed under this Contract is to continue in the succeeding fiscal year contingent upon funds being appropriated by the Legislature for this Work. In the event funds are not appropriated for this Work, this Contract becomes of no effect and is null and void after June 30.

ARTICLE 15
CLAIMS AND DISPUTES

§15.1 Claims

§15.1.2 TIME LIMITS ON CLAIMS

§15.1.2 Delete Section 15.1.2 in its entirety and substitute the following:

Any applicable statute of limitations shall be in accordance with West Virginia Code.

§15.1.3 **NOTICE OF CLAIMS** Add the following to § 15.1.3:

§15.1.3.3 All claims, and notice of claims that require an increase in contract time, contract scope, or contract sum must be made in writing.

§ 15.1.8 is added to the Contract as follows:

§ 15.1.8 Counterclaims – In the event that Contractor makes a claim, Owner reserves the right to make a counterclaim and will not be barred from doing so even if final payment has been made.

§15.2 INITIAL DECISION

§15.2.1 In the third sentence of Section 15.2.1 , insert "or litigation" following the word "mediation" and remove the phrase "binding dispute resolution" and replace it with "or litigation".

§15.2.5 Delete the last sentence in Section 15.2.5 and substitute the following:

Approval or rejection of a claim by the Initial Decision Maker shall be final and binding on the parties unless it is pursued further by either party in accordance with Section 15.2.6.

§15.2.6 Make the following change to clause 15.2.6.1:

In the last sentence, delete "or pursue binding dispute resolution proceedings."

§15.2.8 Delete Section 15.2.8 in its entirety.

§15.3 MEDIATION

§15.3.1 Delete "binding dispute resolution" and substitute "litigation in a court of competent jurisdiction."

§15.3.2 Delete Section 15.3.2 in its entirety and substitute the following:

§15.3.2 The parties shall endeavor to resolve their Claims by non-binding mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement.

§ 15.3.3 Remove section 15.3.3 in its entirety

§15.4 ARBITRATION

§15.4 Delete Section 15.4 in its entirety and substitute the following:

§15.4 SETTLEMENT OF CLAIMS

§15.4.1 The Constitution of West Virginia grants the State sovereign immunity from any and all Claims against the public treasury. This immunity applies and is extended to all agencies of the State, including the Owner. It shall be in full force and effect as it relates to this Contract. The West Virginia Legislature, recognizing that certain Claims against the State may constitute a moral obligation of the State and should be heard, has established the West Virginia Claims Commission for this purpose. The Parties understand that this sovereign immunity and the Constitution of the

State of West Virginia prohibit the State and Owner, from entering into binding arbitration. Notwithstanding any provision to the contrary in the Contract Documents, all references to arbitration, regardless of whether they are included in the AIA Document A201-2017 or another related document are hereby deleted and all Claims of the Contractor for monetary relief, and only of the Contractor, arising out of or related to this Contract shall be decided by the West Virginia Claims Commission. The following Sections have been rewritten to bring them into conformance with the foregoing.

§15.4.2 Claims by the Owner may be brought against the Contractor in the Circuit Court of Kanawha County, West Virginia, or in any other court that has jurisdiction, as the Owner may elect.

§15.4.3 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Sections 15.1.6, 9.10.4 and 9.10.5, shall, within 30 days after submission of the decision by the Initial Decision Maker, be settled for the Contractor by the West Virginia Claims Commission or, for the Owner, by the Circuit Court of Kanawha County or any other court of jurisdiction as the Owner may elect.

§15.4.4 Notice of such action shall be filed in writing with the other party to the Contract, and a copy of such notice shall be filed with the Initial Decision Maker and the Architect, if applicable.

§15.4.5 During court proceedings, the Owner and the Contractor shall comply with Section 15.1.3.

§15.4.6 Claims shall be made within the time limits specified in Section 15.2.6.1.

§15.4.7 The party filing a Claim must assert in the demand all Claims then known to that party on which action is permitted.

Add the following Article:

ARTICLE 16
EQUAL OPPORTUNITY

§16.1 COMPLIANCE WITH REGULATIONS UNDER TITLE VI OF THE FEDERAL CIVIL RIGHTS ACT OF 1964 AND EXECUTIVE ORDER 65-2 BY THE GOVERNOR OF WEST VIRGINIA DATED DECEMBER 15, 1965

§16.1.1 The Contractor agrees that it will comply with Title VI of the Federal Civil Rights Act of 1964 (P.L. 88352) and the regulations of the State of West Virginia, to the end that no person in the State, or in the United States, shall on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or otherwise subjected to discrimination under any program or activity for which the Contractor receives any recompense or other consideration of value, either directly or indirectly from the State; and HEREBY GIVES ASSURANCE THAT it will immediately take any measures necessary to effectuate this Agreement.

§16.1.2 If any real property or structure thereon is provided or improved, this assurance shall obligate the Contractor, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which any State payment is extended or for another purpose involving the provision of similar services or benefits. If any other goods or services are so provided, this assurance shall obligate the Contractor for the period during which it supplies such goods or services.

§16.1.3 The Contractor recognizes and agrees that such right to provide property, goods or services to the State will be extended in reliance on the representations and agreements made in assurance, and that the State shall have the right to seek judicial enforcement of this assurance. This is binding on the Contractor, its successors, transferee, and assignee, or any authorized person on behalf of the Contractor.

END OF SUPPLEMENTARY CONDITIONS TO AIA DOCUMENT A201-2017

Any provisions of the Contract Documents that conflict with these Supplementary Conditions shall be null and void unless they have been approved in writing by the applicable State purchasing officer and the Attorney General, and are clearly identified as such in the bid documents.

The Owner and Contractor hereby agree to the full performance of the covenants contained herein.

IN WITNESS WHEREOF, the Owner and Contractor have entered into this Agreement as of the effective date as stated in the A101-2017 Agreement.

Owner:		Contractor:	
By:	_____	By:	_____
Title:	_____	Title:	_____
Date:	_____	Date:	_____

This Supplementary Conditions to AIA Document A201-2017, General Conditions of the Contract for Construction, has been approved as to form on this 10th day of October, 2018, by the West Virginia Attorney General's office as indicated in the signature line below.

Any modification of this document is void unless expressly approved in writing by the West Virginia Attorney General's Office.

PATRICK MORRISEY, ATTORNEY GENERAL

BY: _____

DEPUTY ATTORNEY GENERAL

AIA® Document G701™ – 2017

Change Order

PROJECT: *(Name and address)*	CONTRACT INFORMATION: Contract For: Date:	CHANGE ORDER INFORMATION: Change Order Number: 003 Date:
OWNER: *(Name and address)*	ARCHITECT: *(Name and address)*	CONTRACTOR: *(Name and address)*

THE CONTRACT IS CHANGED AS FOLLOWS:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was	$	0.00
The net change by previously authorized Change Orders	$	0.00
The Contract Sum prior to this Change Order was	$	0.00
The Contract Sum will be increased by this Change Order in the amount of	$	0.00
The new Contract Sum including this Change Order will be	$	0.00

The Contract Time will be increased by Zero (0) days.
The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT *(Firm name)*	CONTRACTOR *(Firm name)*	OWNER *(Firm name)*
SIGNATURE	SIGNATURE	SIGNATURE
PRINTED NAME AND TITLE	PRINTED NAME AND TITLE	PRINTED NAME AND TITLE
DATE	DATE	DATE

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AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:

PROJECT:

APPLICATION NO: 002
PERIOD TO:
CONTRACT FOR: General Construction
CONTRACT DATE:
PROJECT NOS: / /

Distribution to:
OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

FROM CONTRACTOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	$0.00
2. NET CHANGE BY CHANGE ORDERS	$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)	$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	$0.00
5. RETAINAGE:	
a. 0 % of Completed Work (Column D + E on G703)	$0.00
b. 0 % of Stored Material (Column F on G703)	$0.00
Total Retainage (Lines 5a + 5b or Total in Column I of G703)	$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)	$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	$0.00
8. CURRENT PAYMENT DUE	$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

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AIA® Document G703™ – 1992

Continuation Sheet

AIA Document, G702™–1992, Application and Certification for Payment, or G736™–2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:	001
APPLICATION DATE:	
PERIOD TO:	
ARCHITECT'S PROJECT NO:	

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD					
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	0.00%	$0.00	$0.00

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AIA® Document G704™ – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)*	**CONTRACT INFORMATION:**	**CERTIFICATE INFORMATION:**
18013	Contract For: General Construction Date:	Certificate Number: 001 Date:
OWNER: *(name and address)*	**ARCHITECT:** *(name and address)*	**CONTRACTOR:** *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.
(Identify the Work, or portion thereof, that is substantially complete.)

ARCHITECT *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE OF SUBSTANTIAL COMPLETION**

WARRANTIES
The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:
(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED
A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:
(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within ( ) days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: $

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE**
OWNER *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE**

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AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐ ARCHITECT: ☐
	CONTRACT FOR: General Construction	CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR: General Construction	ARCHITECT: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☐
		SURETY: ☐
		OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR: General Construction	ARCHITECT: ☐
		CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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AIA® Document G707A™ – 1994

Consent of Surety to Reduction in or Partial Release of Retainage

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR: General Construction	ARCHITECT: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	CONTRACTOR: ☐
		SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves the reduction in or partial release of retainage to the Contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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AIA® Document G709™ – 2018

Proposal Request

PROJECT: *(name and address)*	**CONTRACT INFORMATION:** Contract For: General Construction Date:	Architect's Project Number: Proposal Request Number: 001 Proposal Request Date:
OWNER: *(name and address)*	**ARCHITECT:** *(name and address)*	**CONTRACTOR:** *(name and address)*

The Owner requests an itemized proposal for changes to the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. The Contractor shall submit this proposal within Zero (0) days or notify the Architect in writing of the anticipated date of submission.
(Insert a detailed description of the proposed modifications to the Contract Documents and, if applicable, attach or reference specific exhibits.)

THIS IS NOT A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE, OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

REQUESTED BY THE ARCHITECT:

PRINTED NAME AND TITLE

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Architect's Supplemental Instructions

PROJECT: *(name and address)*	**CONTRACT INFORMATION:** Contract For: General Construction Date:	**ASI INFORMATION:** ASI Number: 001 Date:
OWNER: *(name and address)*	**ARCHITECT:** *(name and address)*	**CONTRACTOR:** *(name and address)*

The Contractor shall carry out the Work in accordance with the following supplemental instructions without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in the Contract Sum or Contract Time.
(Insert a detailed description of the Architect's supplemental instructions and, if applicable, attach or reference specific exhibits.)

ISSUED BY THE ARCHITECT:

ARCHITECT *(Firm name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE

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AIA® Document G714™ – 2017

Construction Change Directive

PROJECT: *(name and address)*	CONTRACT INFORMATION:	CCD INFORMATION:
	Contract For: General Construction Date:	Directive Number: 001 Date:
OWNER: *(name and address)*	**ARCHITECT:** *(name and address)*	**CONTRACTOR:** *(name and address)*

The Contractor is hereby directed to make the following change(s) in this Contract:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits.)

PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:
   - ☒ Lump Sum decrease of $0.00
   - ☐ Unit Price of $ per
   - ☐ Cost, as defined below, plus the following fee:
     (Insert a definition of, or method for determining, cost)
   - ☐ As follows:

2. The Contract Time is proposed to remain unchanged. The proposed adjustment, if any, is (0 days).

NOTE: The Owner, Architect and Contractor should execute a Change Order to supersede this Construction Change Directive to the extent they agree upon adjustments to the Contract Sum, Contract Time, or Guaranteed Maximum price for the change(s) described herein.

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.

ARCHITECT *(Firm name)*	OWNER *(Firm name)*	CONTRACTOR *(Firm name)*
SIGNATURE	SIGNATURE	SIGNATURE
PRINTED NAME AND TITLE	PRINTED NAME AND TITLE	PRINTED NAME AND TITLE
DATE	DATE	DATE

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AIA® Document G716™ – 2004

Request for Information ("RFI")

TO: FROM:

PROJECT: ISSUE DATE: RFI No. 001

PROJECT NUMBERS: / REQUESTED REPLY DATE:
COPIES TO:

RFI DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHMENTS: *(List specific documents researched when seeking the information requested.)*
SPECIFICATIONS: **DRAWINGS:** **OTHER:**

SENDER'S RECOMMENDATION: *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

RECEIVER'S REPLY: *(Provide answer to RFI, including cost and/or schedule considerations.)*

BY DATE COPIES TO

Note: This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.
10. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: East Campus Project.

B. Project Location: WV State Capitol Campus
Charleston, West Virginia

C. Owner: WV Department of Administration
General Services Division
112 California Avenue, 5th Floor
Charleston, WV 25305

D. Architect: Chapman Technical Group
200 Sixth Avenue
St. Albans, West Virginia 25177

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

Base Bid: Provide all work for warehouse, open storage, and bulk storage buildings.

Alternate 1: Provide Base Bid work and all work associated with mail room.

Alternate 2: Provide Base Bid, Alternate 1, and all work associated with generator yard, road, and parking area noted.

Alternate 3: Provide Base Bid, Alternate 1, Alternate 2, and all work associated with the parking area noted.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in phases, sequenced, as noted on the plans. Phase 1 shall be Substantially Complete and the Owner shall take occupancy of the area prior to the Existing Block Mechanics Shop being demolished. Subsequent phases of construction shall not interfere with the Owner's occupation and use of the new Mechanics Shop.

1.6 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Required Access: Access to the existing buildings shall be maintained throughout the project. Disruption of public parking shall be minimized and coordinated with the Owner.
2. Limits: Confine construction operations to areas indicated and within the Contract Limits. Coordinate progression of demolition and construction with Owner with sufficient time to allow the Owner to take necessary steps and moves to clear the area for construction activities.
3. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
c. Contractor must maintain access for the WV Office of Technology, its vendors and customers to both the existing Mailroom and/or the new Mailroom, if constructed, for the entire life of the project.
d. Contractor shall provide space within its laydown area for two (2) Owner dumpsters, while allowing access for service to both dumpsters.

4. On Site Storage: Owner will designate areas for lay down and storage of materials on the Project Site.
5. Contractor Personnel Parking: Owner will designate areas on the Project Site to be utilized for parking for Contractor's forces.

C. Additional work may be performed under separate contracts. The Contractor must coordinate work and cooperate with other.

1.7 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will partially occupy the site and adjacent buildings during the construction period, with the exception of areas actively under construction. Cooperate with Owner during phased construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than seventy-two (72) hours notice to Owner of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Work hours shall be coordinated with the Owner prior to commencement of the work. Off hour and weekend work hours are encouraged but not required.

1. Hours for Utility Shutdowns: Utility shutdowns are not permitted during the Owner's operating hours unless previously coordinated with the Owner at least seventy-two (72) hours prior to the shutdown.
2. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   a. Notify Architect and Owner not less than 3 days in advance of proposed utility interruptions and written permission from the Owner before proceeding with utility interruptions.

C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

D. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

E. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

F. Safety Plan: Contractor must develop safety plan for the duration of the construction.

1. Safety Plan should highlight specific high-risk activities and detail the safety considerations, identify the potential hazard, and describe implementation measures to address hazards.

2. Safety Plan should provide site specific information for responding to an emergency when working from heights with limited access.

a. Ensure that appropriate first responders have been notified of scope of project and verify the ability to access all work areas in the event a rescue is required.

2. Safety Plan should identify and provide contact information for designated safety personnel and alternates in case of primary personnel absence.

4. Safety Plan should identify typical site safety requirements, to include appropriate Personal Protection Equipment (PPE) for all tasks to be completed as part of the Scope of Work.

5. Safety Plan shall contain a narrative describing measures for fall protection where necessary and safety provisions for the Work.

6. Safety Plan shall follow guidelines of “Jobsite Safety Handbook” for the Department of Administration and the General Services Division. Prior to beginning any work on the jobsite, Contract must acknowledge the Owner’s “Jobsite Safety Handbook”, attached hereto.

7. Contractor is responsible for complying with all safety, health and sanitation laws.

8. Contractor shall submit a copy to the GSD Project Manager prior to starting work.

9. Contractor shall notify GSD when outside safety agencies including Fire Marshall and OSHA are on site.

10. The West Virginia Division of General Services’ Jobsite Safety Handbook is provided at the end of this section. The Contractor is wholly responsible for jobsite safety. The Architect shall assume no responsibility for the adherence to the Jobsite Safety Handbook or any other issues related to jobsite safety.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

Jobsite Safety Handbook

For Contractors

Department of Administration (DOA)

General Services Division (GSD)

112 California Avenue
Building Four, 5th Floor
Charleston, WV

THIS HANDBOOK IS TO BE POSTED IN A VISIBLE AREA AT ALL CONSTRUCTION PROJECTS AND/OR CONTRACTOR WORKSITES

Contractor Contact: _____ Phone #: _____

EMERGENCY CONTACTS:

Project Manager:

Name: _____ Phone #: _____

Emergency Services #: _____

GSD Safety Section:

112 California Ave, Bldg.4 5th Floor. Charleston, WV 25305

Jonathan Trout: Work# 304 352-5522 Cell# 304-205-2721

Marsha Bowling Work# 304-352-5523 Cell# 304-951-1410

Revision 8/17/21

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Jobsite Safety Handbook

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JOBSITE SAFETY HANDBOOK

The following is a summary of applicable jobsite safety requirements. This handbook is intended to be used as a guide and in no way reflects all applicable safety requirements. All employees are responsible for ensuring a safe working environment. All hazards must be addressed regardless if they have been addressed in this handbook. All contractors working on GSD projects are required to follow OSHA regulations.

GSD safety and health procedures are available for review 24/7 in the Main Capitol Building basement, MB-69.

1. BUILDING ALARMS

In the event of a fire, sound the alarm and/or notify other building occupants immediately. Contractor personnel shall respond appropriately to all alarms by exiting the building immediately and remaining at least 50 feet from the building to allow for emergency response access.

2. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Workers must use personal protective equipment, such as:

- Hard hats when overhead, falling or flying hazards exist;
- Safety glasses or face shields for welding, cutting, nailing (including pneumatic), or when working with concrete and/or harmful chemicals;
- Proper shoes or boots to lessen slipping hazards and prevent toe crushing and nail punctures;
- Safety belts and/or harness systems for fall protection.

3. HOUSEKEEPING AND ACCESS AROUND SITE

- Keep all walkways and stairways clear of trash/debris and other materials such as tools and supplies to prevent tripping.
- Keep boxes, scrap lumber and other materials picked up and put in a dumpster or trash/debris area to prevent fire and tripping hazards.
- Provide enough light to allow workers to see and to prevent accidents.

4. STAIRS AND LADDERS

- All stairs are to be equipped with standard handrails.
- Keep ladders in good condition and free of defects – Do not use job made ladders.
- Inspect ladders before use for broken rungs or other defects so falls don’t happen. Discard defective ladders.
- Secure ladders at the top and brace or tie off at the bottom to prevent them from slipping and causing falls.

5. SCAFFOLDS AND OTHER WORK PLATFORMS

Scaffolding is to be assembled and used according to OSHA regulations.

General scaffolding guidance:

- Provide ladders or stairs to access scaffold and work platforms safely.
- Keep scaffolds and work platforms free of debris. Keep tools and materials as neat as possible on scaffolds and platforms. This will help prevent materials from falling and workers from tripping.
- Erect scaffolds on firm and level foundations.
- Scaffold legs must be placed on firm footing and secured from movement or tipping, especially on dirt or similar surfaces (a good foundation is a must).
- Erecting and dismantling scaffolds must be under the supervision of a Competent Person.
- The competent person must inspect scaffolds before each use.
- Don't use blocks, bricks, or pieces of lumber to level or stabilize the footings. Manufactured base plates or "mud sills" made of hardwood or equivalent can be used.

Planking:

- Fully plank or use manufactured decking to provide a full work platform on scaffolds. The platform decking and/or scaffold planks must be scaffold grade and not have any visible defects.
- Extend planks or decking material at least 6' over the edge or cleat them to prevent movement. The work platform or planks must not extend more than 12" beyond the end supports to prevent tipping when stepping or working.
- Be sure that manufactured scaffolds are the proper size and that the end hooks are attached to the scaffold frame.

Guardrails:

- Guard scaffold platforms that are more than 10 feet above the ground or floor surface must have a standard guardrail. If guardrails are not practical, use other fall protection devices such as safety belts/harnesses and lanyards.
- Place the top rail approximately 42" above the work platform or planking, with a mid-rail about half that high at 21".
- Install toe boards when other workers are below the scaffold.

6. FALL PROTECTION

OSHA has specific and detailed requirements for fall protection – refer to 29 CFR 1926 Subpart M, 29 CFR 1910, 29 CFR Subpart I. A few of those requirements are listed below:

Guarding:

- Install guardrails around open floors and walls when the fall distance is 4’ or more. The top rail must withstand a 200 lb load.
- Construct guardrails with a top rail approximately 42” high with a midrail about half that high at 21”.
- Install toe boards when other workers are below the work area.
- Cover floor openings larger than 2x2 (inches) with material to safely support the working load.
- Use other fall protection systems like personal fall arrest systems (harness & lanyard), slide guards, roof anchors or alternative safe work practices when a guardrail system cannot be used. Only wear proper shoes or footwear to lessen slipping hazards.
- Train workers on safe work practices before performing work on foundation walls, roofs, trusses, or where performing exterior wall erections and floor installations.
- Flagging systems can be used, where appropriate. Flagging systems must comply with OSHA guidance.

7. EXCAVATION AND TRENCHING

Refer to OSHA regulations for excavation and trenching requirements, along with regulations for walking and working surfaces: 29 CFR 1926 Subpart P, 29 CFR 1910 Subpart D

Some of the Excavation and Trenching requirements are listed below:

- Find the location of all underground utilities by contacting West Virginia 811 before digging. Dial 811 or 800-245-4848.
- Keep workers away from digging equipment and never allow workers in an excavation when equipment is in use.
- Keep workers from getting between equipment in use and other obstacles and machinery that can cause crushing hazards.
- Keep equipment and the excavated dirt back 2 feet from the edge of the excavation.
- Have a competent person conduct daily inspections and correct any hazards before workers enter a trench or excavation.
- Provide workers a way to get into and out of a trench or excavation. Ladders and ramps can be used and must be within 25’ of the worker.
- For excavations and utility trenches over 5 feet deep, use shoring (trench boxes), benching, or slope back the sides. Unless soil analysis has been completed, the earth’s slope must be at least 1-1/2 horizontal to 1 vertical
- Keep water out of trenches with a pump or drainage system, and inspect the area for soil movement and potential cave-ins.
- Open ditches more than 24 hours or overnight must have fence protection.
- Keep drivers in the cab and workers away when dirt and other debris are being loaded into dump trucks. Workers must never be allowed under any load and must stay clear of the back of vehicles.

8. TOOLS AND EQUIPMENT

- Maintain all hand tools and equipment in safe condition and check regularly for defects. Broken or damaged tools and equipment must be removed from the jobsite.
- Use double insulated tools, or ensure the tools are grounded (check for ground plug).
- Equip all power saws (circular, skill, table, etc) with blade guards. Saws must be turned off when unattended. Unplug all power tools when not in use.
- Make sure cords are not damaged. The outer insulation must not be cut or damaged.
- Pneumatic and powder-actuated tools must only be used by trained and experienced personnel. Require proper eye protection for workers.
- Never leave cartridges for pneumatic or powder-actuated tools unattended. Keep equipment in a safe place, according to manufacturer's instructions.

9. VEHICLES AND MOBILE EQUIPMENT

- Inform workers verbally and provide training to stay clear of backing and turning vehicles and equipment with rotating cabs.
- Maintain back-up alarms for equipment with limited rear view or use someone to help guide them back.
- Verify experience or provide training to crane and heavy equipment operators.
- Maintain at least 10 foot clearance from overhead power lines when operating equipment.
- Block up the raised bed when inspecting or repairing dump trucks.
- Use a tag line to control materials moved by a crane.

10. ELECTRICAL

- Prohibit work on new and existing energized (hot) electrical circuits until all power is shut off and a positive "Lockout/Tagout System" is in place.
- Maintain all electrical tools and equipment in safe condition and check regularly for defects.
- Broken or damaged tools and equipment must be removed from the jobsite.
- Protect all temporary power (including extension cords) with Ground Fault Circuit Interrupters (GFCI's). Plug into a GFCI protected temporary power pole, a GFCI protected generator, or use a GFCI extension cord to protect against shocks.
- Locate and identify overhead electrical power lines. Make sure that ladders, scaffolds, equipment or materials never come within 10 feet of electrical power lines.
- Exterior electrical must be approved (UL, NEMA, etc) for exterior use (no internal junction boxes).

11. FIRE PREVENTION

- Provide fire extinguishers near all welding, soldering or other ignition sources.
- Avoid spraying of paint, solvents or other types of flammable materials in rooms with poor ventilation. Build up of fumes and vapors can cause explosions or fires.

- Store gasoline and other flammable materials in a safety can outdoors or in an approved storage facility. (Metal cans with self-sealing lids).

12. CHEMICAL HAZARDS

All hazardous chemicals present in the workplace must have an up-to-date Material Safety Data Sheet (MSDS). All contractors shall maintain MSDS for chemicals used or stored at GSD facilities. All warnings and directions for use must be followed.

13. CONFINED SPACES

By definition, a **confined space**:

- Is large enough for an employee to enter fully and perform assigned work;
- Is not designed for continuous occupancy by the employee; and
- Has a limited or restricted means of entry or exit.

These spaces may include underground vaults, tanks, storage bins, pits and diked areas, vessels, silos and other similar areas.

By definition, a **permit-required confined space** has one or more of these characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material with the potential to engulf someone who enters the space;
- Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section; and/or
- Contains any other recognized serious safety or health hazards.

Entry into confined spaces without an evaluation is forbidden. Entry into permit-required confined spaces requires compliance with all OSHA requirements. Entry into non-permit spaces will require an evaluation by GSD Safety to confirm that conditions remain non-permit required.

Contractors that perform confined space entry activities are required to comply with OSHA regulations. GSD will not provide confined space rescue equipment.

14. LOCK-OUT/TAG-OUT

Before working on, repairing, adjusting or replacing equipment and machinery, all appropriate safety procedures, including lockout/tagout, must be utilized to place the machinery or equipment in a neutral or zero mechanical state.

Outside contractors are expected to have knowledge of lock-out/tag-out requirements.

Contractor Acknowledgement:

I, the undersigned, have read, reviewed and acknowledge my understanding of the General Services Division safety requirements, as set forth in this handbook. I am also aware that all applicable rules and regulations are to be followed, regardless of whether they are specifically mentioned in this handbook.

Contractor Representative (Print Name): _____

Contractor Representative Signature: _____ Date: _____

This signed acknowledgement must be signed and returned to the GSD Safety Section prior to start of project work.

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the awarded Contract.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Base Bid: Provide all work for warehouse, open storage, and bulk storage buildings.

B. Alternate 1: Provide Base Bid work and all work associated with mail room.

C. Alternate 2: Provide Base Bid, Alternate 1, and all work associated with generator yard, road, and parking area noted.

D. Alternate 3: Provide Base Bid, Alternate 1, Alternate 2, and all work associated with the parking areas noted.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form **acceptable to Architect**.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from **ICC-ES**.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **seven** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Addendum, Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed **unless otherwise indicated**.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within **20** days prior to bid. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.

h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect or Owner are not instructions either to stop work in progress or to execute the proposed change.
2. Within ten (10) calendar days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Proposal Request Form: Provide the Proposal Request on Contractor's Company Letterhead and in a form acceptable to the Architect.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's acceptance of a Proposal Request, the Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701. Owner will submit completed AIA G701 to the WV State Purchasing Division to request formal approval of the Change Order; multiple proposal requests may be consolidated into a single AIA G701 form. Once the Change Order has been approved and processed by the WV State Purchasing Division, the Change Order shall be added to the Application for Payment. No payments can be made towards a Change Order which increases the Contract Sum until such time that the Change Order has been fully processed and approved by the State Purchasing Division.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.

   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five (5) percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the fifteenth day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

   1. Submit draft copy of Application for Payment seven (7) days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Within ten (10) calendar days of Notice to Proceed, Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within ten (10) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

   a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
   b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
   c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
   e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
   f. Indicate required installation sequences.
   g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.

3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Electronic submissions attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within seven (7) days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log with each application for payment. Include the following information:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
3. Online document collaboration.
4. Reminder and tracking functions.
5. Archiving functions.

1.8 DIGITAL PROJECT MANAGEMENT PRCEEDURES

A. Architect’s Digital Files: Architect will not provide Architect’s drawing (BIM or CAD) files for the Contractor’s use during construction. PDF versions of the drawings will be made available.

1. The Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Contract Drawings.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to

everyone concerned, including Owner and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than three (3) days after award of the contract.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing, if applicable.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.
    m. Use of the premises and the existing building.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

5. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
6. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
7. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Preparation of Contractor's punch list.
    h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    i. Submittal procedures.
    j. Coordination of separate contracts.
    k. Owner's partial occupancy requirements.
    l. Installation of Owner's furniture, fixtures, and equipment.
    m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

D. Progress Meetings: Conduct progress meetings at regular intervals mutually agreed upon with the Owner and Architect but, no more than every two weeks.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Co-ordination issues between trades.
8) Access.
9) Site utilization.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
1. PDF electronic file.
2. Large Format submittals (greater than 11 x 17) 2 paper copies.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a PDF electronic file. Include type of schedule (initial or updated) and date on label.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

G. Qualification Data: For scheduling consultant.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than ten (10) days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner, if applicable.

4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.
    f. Substantial Completion.

7. Other Constraints: As discussed at the Pre-Construction meeting.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven (7) days of start date established by the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at least three (3) days before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Type of Submittals: Discuss with Architect at the Pre-Construction Conference whether or not electronic submittals will be allowed.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal.

E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Architect.
6) Name of Construction Manager.
7) Name of Contractor.
8) Name of firm or entity that prepared submittal.
9) Names of subcontractor, manufacturer, and supplier.
10) Category and type of submittal.
11) Submittal purpose and description.
12) Specification Section number and title.
13) Specification paragraph number or drawing designation and generic name for each of multiple items.
14) Drawing number and detail references, as appropriate.
15) Indication of full or partial submittal.
16) Transmittal number, numbered sequentially.
17) Submittal and transmittal distribution record.
18) Remarks.
19) Signature of transmitter.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files per paper submittal requirements.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: If paper submittals are used, submit two (2) paper copies of each submittal unless otherwise indicated. Architect will return one (1) copies.
3. Informational Submittals: If paper submittals are used. submit two (2) paper copies of each submittal unless otherwise indicated. Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

    a. PDF electronic file, except large format, greater than 11 x 17 inches, shall be paper.
    b. Two (2) copies of each submittal. Architect will return one (1) copy.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit two (2) sets of Samples. Architect will retain one (1) Sample sets; remainder will be returned

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Section 017839 "Project Record Documents."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design

criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit signed PDF electronic file and two (2) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional licensed to practice in the State of West Virginia.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows**:**

1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken" that part of the Work covered by the submittal may proceed provided it

complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final But Restricted Release: When submittals are marked "Make Corrections Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Rejected" or "Revise and Resubmit" do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
4. Do not permit submittals marked "Rejected" or "Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data : For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least forty-eight (48) hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. Contractor will utilize testing agencies acceptable to the Owner.
   1. Submit Testing Agency name and contact information to the Architect at least seven (7) days prior to scheduled test to be performed.

3.2 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AF&PA - American Forest & Paper Association; www.afandpa.org.
10. AGA - American Gas Association; www.aga.org.
11. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
12. AI - Asphalt Institute; www.asphaltinstitute.org.
13. AIA - American Institute of Architects (The); www.aia.org.
14. AISC - American Institute of Steel Construction; www.aisc.org.
15. AISI - American Iron and Steel Institute; www.steel.org.
16. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
17. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
18. ANSI - American National Standards Institute; www.ansi.org.
19. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
20. APA - APA - The Engineered Wood Association; www.apawood.org.
21. APA - Architectural Precast Association; www.archprecast.org.
22. API - American Petroleum Institute; www.api.org.
23. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
24. ARI - American Refrigeration Institute; (See AHRI).
25. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
26. ASCE - American Society of Civil Engineers; www.asce.org.

27. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
28. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
29. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
30. ASSE - American Society of Safety Engineers (The); www.asse.org.
31. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
32. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
33. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
34. AWEA - American Wind Energy Association; www.awea.org.
35. AWI - Architectural Woodwork Institute; www.awinet.org.
36. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
37. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
38. AWS - American Welding Society; www.aws.org.
39. AWWA - American Water Works Association; www.awwa.org.
40. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
41. BIA - Brick Industry Association (The); www.gobrick.com.
42. BICSI - BICSI, Inc.; www.bicsi.org.
43. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
44. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
45. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
46. CDA - Copper Development Association; www.copper.org.
47. CEA - Canadian Electricity Association; www.electricity.ca.
48. CEA - Consumer Electronics Association; www.ce.org.
49. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
50. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
51. CGA - Compressed Gas Association; www.cganet.com.
52. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
53. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
54. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
55. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
56. CPA - Composite Panel Association; www.pbmdf.com.
57. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
58. CRRC - Cool Roof Rating Council; www.coolroofs.org.
59. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
60. CSA - Canadian Standards Association; www.csa.ca.
61. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
62. CSI - Construction Specifications Institute (The); www.csinet.org.
63. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
64. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
65. CWC - Composite Wood Council; (See CPA).
66. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
67. DHI - Door and Hardware Institute; www.dhi.org.
68. ECA - Electronic Components Association; (See ECIA).

69. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
70. ECIA ? Electronic Components Industry Association; www.eciaonline.org
71. EIA - Electronic Industries Alliance; (See TIA).
72. EIMA - EIFS Industry Members Association; www.eima.com.
73. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
74. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
75. ESTA - Entertainment Services and Technology Association; (See PLASA).
76. EVO - Efficiency Valuation Organization; www.evo-world.org.
77. FM Approvals - FM Approvals LLC; www.fmglobal.com.
78. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
79. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
80. FSA - Fluid Sealing Association; www.fluidsealing.com.
81. FSC - Forest Stewardship Council U.S.; www.fscus.org.
82. GA - Gypsum Association; www.gypsum.org.
83. GANA - Glass Association of North America; www.glasswebsite.com.
84. GS - Green Seal; www.greenseal.org.
85. HI - Hydraulic Institute; www.pumps.org.
86. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
87. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
88. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
89. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
90. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
91. IAS - International Accreditation Service; www.iasonline.org.
92. IAS - International Approval Services; (See CSA).
93. ICBO - International Conference of Building Officials; (See ICC).
94. ICC - International Code Council; www.iccsafe.org.
95. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
96. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
97. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
98. IEC - International Electrotechnical Commission; www.iec.ch.
99. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
100. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
101. IESNA - Illuminating Engineering Society of North America; (See IES).
102. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
103. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
104. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
105. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
106. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
107. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
108. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
109. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
110. ISO - International Organization for Standardization; www.iso.org.
111. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
112. ITU - International Telecommunication Union; www.itu.int/home.
113. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
114. LMA - Laminating Materials Association; (See CPA).

115. LPI - Lightning Protection Institute; www.lightning.org.
116. MBMA - Metal Building Manufacturers Association; www.mbma.com.
117. MCA - Metal Construction Association; www.metalconstruction.org.
118. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
119. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
120. MHIA - Material Handling Industry of America; www.mhia.org.
121. MIA - Marble Institute of America; www.marble-institute.com.
122. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
123. MPI - Master Painters Institute; www.paintinfo.com.
124. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
125. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
126. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
127. NADCA - National Air Duct Cleaners Association; www.nadca.com.
128. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
129. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
130. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
131. NCMA - National Concrete Masonry Association; www.ncma.org.
132. NEBB - National Environmental Balancing Bureau; www.nebb.org.
133. NECA - National Electrical Contractors Association; www.necanet.org.
134. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
135. NEMA - National Electrical Manufacturers Association; www.nema.org.
136. NETA - InterNational Electrical Testing Association; www.netaworld.org.
137. NFHS - National Federation of State High School Associations; www.nfhs.org.
138. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
139. NFPA - NFPA International; (See NFPA).
140. NFRC - National Fenestration Rating Council; www.nfrc.org.
141. NHLA - National Hardwood Lumber Association; www.nhla.com.
142. NLGA - National Lumber Grades Authority; www.nlga.org.
143. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
144. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
145. NRCA - National Roofing Contractors Association; www.nrca.net.
146. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
147. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
148. NSPE - National Society of Professional Engineers; www.nspe.org.
149. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
150. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
151. NWFA - National Wood Flooring Association; www.nwfa.org.
152. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
153. PDI - Plumbing & Drainage Institute; www.pdionline.org.
154. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
155. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
156. RFCI - Resilient Floor Covering Institute; www.rfci.com.
157. RIS - Redwood Inspection Service; www.redwoodinspection.com.
158. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
159. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
160. SDI - Steel Deck Institute; www.sdi.org.
161. SDI - Steel Door Institute; www.steeldoor.org.

162. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
163. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
164. SIA - Security Industry Association; www.siaonline.org.
165. SJI - Steel Joist Institute; www.steeljoist.org.
166. SMA - Screen Manufacturers Association; www.smainfo.org.
167. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
168. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
169. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
170. SPIB - Southern Pine Inspection Bureau; www.spib.org.
171. SPRI - Single Ply Roofing Industry; www.spri.org.
172. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
173. SSINA - Specialty Steel Industry of North America; www.ssina.com.
174. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
175. STI - Steel Tank Institute; www.steeltank.com.
176. SWI - Steel Window Institute; www.steelwindows.com.
177. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
178. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
179. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
180. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
181. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
182. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
183. TMS - The Masonry Society; www.masonrysociety.org.
184. TPI - Truss Plate Institute; www.tpinst.org.
185. TPI - Turfgrass Producers International; www.turfgrasssod.org.
186. TRI - Tile Roofing Institute; (Formerly: National Tile Roofing Manufacturing Association); www.tileroofing.org.
187. UBC - Uniform Building Code; (See ICC).
188. UL - Underwriters Laboratories Inc.; www.ul.com.
189. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
190. USAV - USA Volleyball; www.usavolleyball.org.
191. USGBC - U.S. Green Building Council; www.usgbc.org.
192. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
193. WASTEC - Waste Equipment Technology Association; www.wastec.org.
194. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
195. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
196. WDMA - Window & Door Manufacturers Association; www.wdma.com.
197. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
198. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
199. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
200. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fer Normung e.V.; www.din.de.

2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).

7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014533 – SPECIAL INSPECTIONS

CONTRACTOR'S RESPONSIBILITIES

A. It is the responsibility of the Contractor to coordinate and schedule the Special Inspector's inspections and testing for the work as noted in this Section.

B. Article 3.2 "Duties and Responsibilities of the Contractor" apply to the Contractor and delineate the Contractor's duties and responsibilities. Otherwise, the following information is the Special Inspector's responsibility, provided for Contractor's information and coordination purposes.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Contractor shall engage a third-party Special Inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports as outlined in this Specification and Chapter 17 of the International Building Code.

B. This Section includes administrative and procedural requirements for Special Inspection as defined in Chapter 17 of the 2015 International Building Code.

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

D. Perform Special Inspection as specified. Special Inspector personnel shall be in addition to the quality control inspections and inspectors required elsewhere in other Specifications by the Contractor.

1.3 SUBMITTALS

A. Prepare and/or assemble and submit certifications:

1. Special Inspector's Qualifications: Submit before the start of construction.
2. Special Inspectors Final Certification: Submit after completion of inspections.

1.4 INSPECTIONS

A. Concrete Construction

1. In accordance with Table 1705.3 of the 2015 International Building Code.

TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TEST OF CONCRETE CONSTRUCTION

TYPE	Continuous Special Inspection	Periodic Special Inspection	Referenced Standard	IBC Reference
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	X	ACI 318 Ch. 20, 25.2, 25.3, 26.5.1-26.5.3	1908.4
2. Reinforcing bar welding: a. Verify weldability of reinforcing bars other than ASTM A 706; b. Inspect single-pass fillet welds, maximum 5/16" and c. Inspect all other welds.	— X	X X	AWS D1.4 ACI 318: 26.5.4	—
3. Inspect anchors cast in concrete.	—	X	ACI 318 17.8.2	—
4. Inspect anchors post-installed in hardened concrete members. a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. b. Mechanical anchors and adhesive anchors not defined in 4.a.	X	X	ACI 318: 17.8.2.4 ACI 318: 17.8.2	—
5. Verify use of required design mix.	—	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength test, perform slump and air content tests, and determine the temperature of the concrete. See the Concrete Specification for additional testing/inspection requirements.	X	—	ASTM C 172 ASTM C 31 ACI 318: 26.4.5, 26.12	1908.10
8. Verify maintenance of specified curing temperature and techniques.	—	X	ACI 318: 26.4.7-26.4.9	1908.9
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: 26.10.1 (b)	—

B. Soils Construction

1. In accordance with Table 1705.6 of the 2015 International Building Code.

TABLE 1705.6
REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

Type	Continuous Special Inspection	Periodic Special Inspection
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	—	X
2. Verify excavations are extended to proper depth and have reached proper material.	—	X
3. Perform classification and testing of compacted fill materials.	—	X
4. Verify use of proper materials, densities and lift thickness during placement and compaction of compacted fill.	X	—
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	—	X

C. Auger Cast Pile Construction:

1. See Auger Cast Pile specification for inspection and load testing requirements.

D. Welding of Reinforcing Bars:

1. Special inspections of welding and qualifications of special inspectors for reinforcing bars shall be in accordance with the requirements of AWS D1.4 for special inspection and of AWS D1.4 for special inspector qualification.

E. Steel Construction:

1. Special Inspections and nondestructive testing of structural steel elements in buildings, structures and portions thereof shall be in accordance with the quality assurance inspection requirements of AISC 360.

1.5 QUALIFICATIONS

A. Use a qualified Special Inspector to perform Special Inspections required by this Section.

B. Special Inspector's qualifications shall include information which provides evidence of the knowledge and experience necessary to qualify a person as a Special Inspector for the category of work being certified.

C. The Special Inspector is a person employed by the Contractor.

D. Special Inspectors perform their duties independent from the construction quality control staff employed by the Contractor.

E. More than one Special Inspector may be required to provide the varied knowledge and experience necessary to adequately inspect all of the categories of work requiring Special Inspection.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DUTIES AND RESPONSIBILITIES OF THE SPECIAL INSPECTOR

A. The Special Inspector shall observe the Work and perform tests to ensure conformance with the design drawings and specifications, and the applicable workmanship provisions of the 2015 International Building Code.

1. Approved shop drawings may be used only as an aid to inspection.
2. The Special Inspector shall observe activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
3. The Special Inspector shall submit timely inspection reports; weekly at a maximum.

B. The Special Inspector shall obtain from the contractor all certifications required to be submitted as part of the special inspection requirements (e.g. Fabricators' Quality Control Plans, Material Certifications) and submit them along with the field inspections and tests that the Special Inspector performs. Special Inspection submittals by the Special Inspector include ***ALL*** items included above, not just the ones that the Special Inspector prepares.

C. The Special Inspector shall cooperate with the Contractor and provide timely service, keep records of all inspections and furnish them in a timely manner to the Engineer/Architect, and Contractor as construction progresses.

D. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If discrepancies are not corrected, the discrepancies shall be brought to the attention of the Engineer/Architect prior to the completion of that phase of work.

E. Inspection Reports shall include the following:

1. Name, address, and telephone number of Special Inspector performing the inspection and making the report.
2. Dates and locations of samples and tests or inspections, date of report.
3. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
4. Description of the Work, identification of products, Specification Section, tests, and inspection methods.
5. Complete test or inspection data.
6. Test and inspection results and an interpretation of test results.
7. Statement on condition of substrates and their acceptability for installation of the product.
8. Statement that products at site comply with requirements.
9. Comments on professional opinion on whether tested, inspected, or installed Work complies with the Contract Document requirements.
10. Statement whether conditions, products, and installation will affect warranty.

11. Other required items indicated in individual Specification Sections.

F. Special Inspector's Final Certificates shall state that all items requiring Special Inspection and Testing were fulfilled and are in conformance with the approved design and shop drawings, specifications, approved change orders, and the applicable provisions of the 2015 International Building Code.

1. Items that were not in conformance and any unresolved discrepancies shall be itemized in the report.
2. Final report shall be bound, divided by construction type, and in chronological order.
3. Final Report shall be prepared by, sealed, and signed by the Special Inspector.

3.2 DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR

A. Notify the Special Inspector with adequate advance notice when construction is ready to be inspected.

B. Provide Special Inspector access to approved plans, shop drawings, and change orders at the jobsite.

C. Provide Special Inspector access to work, including equipment with operator when necessary. Access to equipment includes, but is not limited to, man lifts, excavation equipment, etc.

D. Provide samples of materials to be tested in required quantities.

E. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples. If required by the Special Inspector, Contractor shall provide cure box with electricity, water, and blankets for curing concrete specimens.

F. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections.

G. Retain at the jobsite all Special Inspection records submitted by the Special Inspector and provide these records for review by the Engineer/Architect and Building Inspector upon request.

H. Maintain a discrepancy log on site. Log shall list each discrepancy documented by the Special Inspector, state the date of discovery and Special Inspector's report number. Provide room for the Special Inspector to sign and date when said discrepancy is corrected. No work containing discrepancy shall be covered prior to having reinspection and approval by the Special Inspector.

I. Cooperate with the Special Inspector, Engineer/Architect, and Building Inspector in resolving any Special Inspection related coordination or quality problems.

J. Resolve non-conforming work before additional work is done that would make it difficult to resolve non-conforming work.

K. Costs of additional retesting that are required due to non-conforming work will be charged to the Contractor.

L. Neither the observation of the Engineer/Architect in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Engineer/Architect shall relieve the Contractor from his obligation to perform the work in accordance with the Contract Documents.

END OF SECTION 014533

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
2. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Provide cell phone service for key personnel.

1. Provide the following telephone numbers at the temporary field office.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Owner's office.
g. Principal subcontractors' field and home offices.

J. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Storage and Staging: Use designated areas of Project site for storage and staging needs.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of authorities having jurisdiction, whichever is more stringent and other requirements as indicated on the construction documents.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish

procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings

beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 012300 "Alternates" for products selected under an alternate.
3. Section 014200 "References" for applicable industry standards for products specified.
4. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," or “or equal” including make or model number or other designation.

Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product may also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

    a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit when required, provide two (2) copies signed by a licensed land surveyor.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but, are not limited to:

a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Mechanical systems piping and ducts.
f. Control systems.
g. Communication systems.
h. Fire-detection and -alarm systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.

5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance as required by the drawings or local codes, whichever is greater.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017500 - ENVIRONMENTAL CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division-1 Specifications Sections, apply to work of this Section.

B. Seeding and mulching specifications for permanent seeding, including soil amendments, found in other Division-2 specifications are applicable to temporary seeding.

C. Description of Work

1. Environmental Protection
2. Land Resources Protection
3. Noise Control
4. Dust Control
5. Debris Control
6. Water Pollution Control
7. Sediment Control Plan
8. Erosion Control
9. Air Pollution
10. Protection of Archeological and Historical Findings
11. Disposal of nonhazardous demolition and construction waste.
12. Soil Management Plan

PART 2 - PRODUCTS

2.2 TEMPORARY SEEDING PRODUCTS

A. Seed, mulch and soil amendments used for temporary seeding shall be in accordance with the specifications for seeding found in other Division-2 specifications.

PART 3 - EXECUTION

3.1 APPLICATION

A. Environmental Protection

1. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from their construction activities, the Contractor shall comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatements, as well as all specific requirements stated elsewhere in the contract specifications.

2. The Owner will notify the Contractor in writing of any non-compliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lose due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

    a. The Contractor shall obliterate all signs of temporary construction facilities such as work areas, structures, foundations or temporary structures, stock-piles of excess or waste materials, or any other vestiges of construction as directed. Any spoil above grade around the crown of trees and shrubs shall be removed. The disturbed areas shall be graded and filled as required, and seeded as specified herein.
    b. During the life of this contract, the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is not longer being created. During the construction period the Contractor should conduct frequent training courses for his maintenance personnel. The curricula should include methods of detection of pollution, familiarity with pollution standards, and installation and care of vegetation covers, plants and other facilities to prevent and correct environmental pollution.

B. Land Resources Protection

1. It is intended that the land resources within the project boundaries and outside the limits of permanent work performed under this contract be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. Insofar as possible, the Contractor shall confine his construction activities to areas defined by the plans and specifications.

C. Noise Control

1. Contractor shall comply with all Federal, State or local laws and regulations concerning noise control.

D. Dust Control

1. The Contractor will be required to maintain all work sites, excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which would cause a hazard or nuisance to others. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods will be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust

control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

E. Debris Control

1. The Contractor shall keep all work areas involved in the project free from all trash and debris, including excess or unusable materials.
2. All areas shall be cleaned up and made orderly on a weekly basis; however, should the Architect determine that the health or safety of the public is threatened due to an unkempt work area, he may order the project, or a part of the project, shut down until such time as the area in question is cleaned up.

F. Water Pollution Control

1. The Contractor shall not pollute any rivers or streams with fuels, oils, bitumens, calcium chloride, acids or harmful materials. It is the responsibility of the Contractor to investigate and comply with applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams. All work under this contract shall be performed in such a manner that objectionable conditions will not be created.
2. At all times of the year, special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides, and cement drainage from entering public waters.
3. Disposal of any materials, wastes, effluents, trash garbage, oil, grease, chemicals, etc., in areas adjacent to streams will be subject to approval. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as directed, and replaced with suitable fill material, compacted and finished with topsoil all at the expense of the Contractor.
4. The Contractor shall at all times perform all work and take such steps required to minimize the severity and duration of any interferences or disturbances to fish and wildlife. The Contractor will not be permitted to disturb native habitat adjacent to the project area which, in the opinion of the Owner, are critical to fish and wildlife. Fouling or polluting of water will not be permitted. Wash waters and wastes shall be processed, filtered, ponded, or otherwise treated prior to their release into the streams.

G. Sediment and Erosion Control Plan

1. A Construction Sediment and Erosion Control Plan has been (or will be) filed with the West Virginia Department of Environmental Protection and a construction storm water protection permit has been (or will be) obtained for the project site, if applicable. Any borrow area or waste area used for the project by the Contractor shall be subject to the same environmental controls as the project site.

2. General requirements of the Sediment Control Plan include, but are not limited to sediment control measures indicated on the Drawings, and the following:

   a. Re-vegetation - All work areas shall be seeded and mulched within two weeks of completing construction for that specific area. Permanent vegetative cover should be compatible with adjacent land and/or restored to original condition. All areas where temporary seeding or mulching has been applied will be permanently seeded and mulched immediately after final grading to

establish vegetative cover compatible with adjacent land.

c. Other Construction Practices - Any water pumped from excavated areas shall not be discharged directly into any watercourse. Adequate provisions must be taken to prevent sediment and erosion from entering the watercourse.

d. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds or shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by construction operations shall be held to a minimum. Fills and waste areas shall be constructed by selective placement to eliminate silts or clays on the surface that will erode and contaminate the streams. Drop inlets to the storm drain system shall also be protected from sedimentation by approved methods.

H. Air Pollution

1. The Contractor shall exercise every reasonable precaution throughout the life of the project to keep air pollution to a minimum. The Contractor shall also comply with the applicable regulations of the West Virginia Air Pollution Control Commission. During times of limited dispersion, construction operations may be suspended.

I. Protection of Archeological and Historical Findings

1. Should the Contractor's excavation operations encounter remains of prehistoric people's dwelling sites or artifacts of historical or archeological significance, the operation in that locality shall be temporarily discontinued. The Architect will contact appropriate authorities to determine the disposition thereof.
2. When directed by the Architect, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and shall remove them for delivery to the custody of the proper State authorities. Such excavation will be considered as an extra amount of work, and shall be paid for with a Change Order.
3. The time lost, due to a temporary work stoppage under this item shall be added on to the Contract Time.

J. Soil Management Plan (SMP)

Findings of a Limited Site Investigation (LSI) indicated evidence of hazardous compounds (total petroleum hydrocarbon – diesel range organics [TPH-DRO]) between at least two and eight feet below grade across the site and in some areas deeper. Because laboratory analyses indicated residual TPH-DRO in soils at the site and redevelopment/earthwork activities will occur, the Contractor shall engage a qualified third-party consultant to develop a SMP for use by the Contractor to properly handle impacted soils during earthwork activities and protect site workers potentially exposed to contaminants while working in impacted areas at the site. The purpose of the SMP is to aid as a risk management advisory and provide guidance for managing known hazardous materials or petroleum impacts to soils at the property. It is not required to provide corrective action measures. The SMP shall present methods and actions to be employed in the event impacted soils are encountered and controls that should be

implemented to manage excavated soils. Additionally, the Contractor shall develop a site-specific health and safety plan (HASP) for site workers.

3.2 DEMOLITION WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017500

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

1.3 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
   Perform preventive maintenance on equipment used prior to Substantial Completion.
4. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
6. Complete final cleaning requirements, including touchup painting.
7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:
    a. PDF electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Remove labels that are not permanent.
i. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Miscellaneous record submittals.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one (1) set(s) of marked-up record prints.

B. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit two (2) of each submittal.

C. Reports: Submit written report biweekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Locations of concealed internal utilities.
f. Changes made by Change Order or Construction Change Directive.
g. Changes made following Architect's written orders.
h. Details not on the original Contract Drawings.
i. Field records for variable and concealed conditions.
j. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of executed warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

G. Provide line item within the Schedule of Values in the amount of 5% of the total cost of the job assigned to “Operation and Maintenance Manuals”.

a. If retainage is required within the project, the line item value of the Operation and Maintenance Manuals may be reduced at the discretion of the Architect.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

END OF SECTION 017839

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.
4. Salvaging items for reuse by Owner.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Engineering Survey: Submit engineering survey of condition of building(s).

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

C. Schedule of building demolition activities with starting and ending dates for each activity.

D. Pre-demolition photographs or video.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

1.5 CLOSEOUT SUBMITTALS

A. Inventory of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.7 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before building demolition, Owner will remove the following items:

a. All items that they wish to keep.

D. Hazardous Materials:

1. Hazardous materials previously identified shall be properly removed and disposed of as part of the Work.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials identified during demolition activities shall be properly removed and disposed of as part of the Work.

E. On-site storage or sale of removed items or materials is not permitted.

F. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

C. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished per utility company requirements.

1. Arrange to shut off utilities with utility companies.

2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least (2) two hours after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

C. Explosives: Use of explosives is not permitted.

D. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

E. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

F. Salvage: Items to be removed and salvaged are indicated on Drawings.

G. Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely, to at least (4) four feet below grade.

H. Existing Utilities: Demolish existing utilities and below-grade utility structures to within 5 feet of the property line, unless noted otherwise in the construction documents. Properly terminate or cap utilities as required by each utility company.

I. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

J. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

K. Promptly repair damage to adjacent buildings caused by demolition operations.

3.6 CLEANING

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

B. Do not burn demolished materials.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 024116

SECTION 024660 – AUGER CAST PILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Auger Cast Piles.

B. Related Sections:

1. Section 02230 "Site Clearing" for preparation of subgrade for auger cast pile operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.

1.3 BASIS OF PAYMENT

A. Base bid shall be a lump sum amount.

1. Base the lump sum amount on total footage based on the pile tip elevation indicated on the drawings.
2. Include test piles for the number and types indicated on the drawings.

B. Payment adjustment.

1. Adjustments shall be based on total aggregate length of all piling and not individual piles.
2. No payment will be made for piles that are abandoned or replaced because they do not comply with the contract documents.

    a. The Contractor shall be responsible for engineering costs incurred if redesign is required due to nonconforming piles.
    b. The Contractor shall install additional piles or add grade beams as required by the engineer due to nonconforming piles at his own expense.
    c. Measurements will be based on effective length of piles in place, with fractional lengths measured in nearest foot. Payment for linear footage in excess of that indicated on the drawings, and credit for linear footage less than that indicated on drawings, shall be made at unit prices stated in the contract, based on net addition or deduction.

3. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.

C. Unit Prices:

1. Provide the following unit prices (including set-up charges):

a. Price per foot adding footage to the base vertical pile footage.
b. Price per foot for deleting footage from the base vertical pile footage.

2. Unit prices include labor materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete auger pile installation

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer land surveyor and testing agency.

B. Welding certificates.

C. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.

D. Field quality-control reports.

E. Other Informational Submittals:

1. Record drawings.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in auger cast pile work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.

C. Auger Cast Pile Standard: Comply with ACI 336.1 unless modified in this Section.

D. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to drilled piers including, but not limited to, the following:

a. Review geotechnical report.
b. Discuss existing utilities and subsurface conditions.
c. Review coordination with temporary controls and protections.
d. Determine pre-production pile test locations.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.

1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.

B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Architect no fewer than (two) 2 days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.

1. The geotechnical report is referenced elsewhere in the Project Manual.

D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82.

C. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.2 GROUT MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II.

B. Fine Aggregate: ASTM C 33, graded with a fineness modulus between 1.40 and 3.40.

1. Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Mineral filler: Finely powdered siliceous material capable of combining with the lime liberated during the process of hydration of Portland Cement.

E. Fluidifier: Compound that increases flow ability, assists in cement gain dispersal, reduces bleeding and neutralizes setting shrinkage.

2.3 GROUT MIXTURES AND MIXING

A. Proportion and mix components to provide grout which maintains the solids in suspension without appreciable water gain, is pumped easily, and penetrates laterally to fill subsurface voids.

B. Standard Flow Cone Rate: maximum 15 seconds.

C. Proportion normal-weight concrete mixture as follows:

1. Compressive Strength 28 Days: 4,000 psi.

2.4 EQUIPMENT

A. Auger Equipment:

1. Grout outlet shall be at the bottom of the auger head below the bar containing the cutting teeth.
2. Maintain cutting teeth in serviceable condition.
3. Do not use teeth which worn more than 50%.

4. Auger fighting shall be continuous from auger head to the top of the auger. No gaps or breaks.
5. Maximum Auger Pitch: 9 inches.
6. Auger hollow shaft shall allow placement of #8 central reinforcing bar.
7. Providing an auger guide for augers over 40 feet long.
8. Prevent piling leads from twisting with a stabilizer arm.

B. Pumping Equipment:

1. Pump: Positive displacement, piston type.

   a. Minimum head capacity: 350 psi.
   b. Provide pressure gauges at pump discharge to ensure proper grout pressures.

C. Agitating Storage Tank:

1. Provide agitating tank when ready-mix mortar is used.
2. Size and maintain homogeneous mix and continuity of mortar between ready-mix and mortar pump.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

B. Provide written report on mobilization and methods to protect existing structures, as necessary.

3.2 INSTALLATION

A. General:
1. Verify (by excavation if necessary) that piles clear all existing underground utilities or other existing construction.
2. Advise Architect of any interference.
3. Contractor shall repair, at no cost to the Owner, any damage to existing utilities or existing construction.
4. Install piles by rotating a continuous flight, hollow shaft auger into the ground to the required depths.
5. Remove all oils and rust inhibitors from mixing drums and mortar pumps.
6. Pump mortar under pressure through the hollow shaft as the auger is withdrawn.
7. Fill the hole completely.
8. Provide 10-feet head of grout above the injection point or above the water level, whichever is higher during the raising of the auger.
9. Maximum auger withdrawal rate: 10 feet per minute.

10. Install only materials that produce a homogeneous mortar of the desire consistency. A single addition of water made up on arrival at the job site to adjust fluidity is permissible. Subsequent additions of water will not be allowed.
11. The minimum volume of grout placed in the pile shall be equal to 120% of the theoretical “neat” pile volume of the augered hole.

    a. Provide an in-line flow meter or a mechanical pump stroke counter to verify volume.

12. Re-circulate grout through pump during any lapse in operation.

    a. Do not use grout that is more than 2 ½ hours old from the time of batching.
    b. Do not use grout whose temperature exceeds 90 F.

13. Provide metal sleeves (of the proper diameter and length) for piles with cutoffs near or above the bottom of excavation.

    a. Minimum sleeve length: 18 inches.

14. Inform Architect immediately if any obstruction prevents placement of piles as indicated on the drawings.
15. For closely set piles (within 4’-6” center to center), allow 24 hours to pass before installing adjacent piles.

B. Tolerances:

1. Install piles in locations indicated on the drawings.
2. Piles in group of 3 or more shall be within 3 inches from the design locations. Centroid of pile group shall be within 1.5 inches from the design location.
3. Piles in group of two or single piles shall be located within 1.5 inches from the design location.
4. If location tolerances are exceeded, provide corrective construction. Submit design and construction proposal to Architect for reviewing before proceeding.

3.3 STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

C. Place singular bar full-length reinforcement throughout the hollow shaft auger prior to pumping or auger removal.

D. Multiple bar vertical cages and single bars shall have approved centering devices at spacing designated on structural drawings.

E. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: The Contractor shall engage a qualified Geotechnical representative to inspect the installation of piles and observe pile load testing. As a minimum, the inspection report shall consist of the following:

1. Date, time and weather.
2. Tope of grade elevation.
3. Pile diameter.
4. Pile length (or estimated bottom of pile elevation).
5. Rock socket length.
6. Grout volume (actual).
7. Grout factor (actual or theoretical grout volume ratio).
8. Reinforcement provided.
9. Rebar cover provided.
10. Grout delivery ticket no.
11. Other miscellaneous observations.

B. Survey: The Contractor shall engage a licensed surveyor to prepare as-built survey of all piles and report to the Engineer. The survey shall indicate the design location and actual location of pile cut-off elevations. The report shall indicate deviation from design location in east-west and north-south directions.

1. Perform additional testing and inspecting, at Contractor’s expense, to determine compliance of replaced or additional work with specified requirements.
2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

3.7 REPORTS AND RECORDS

A. At conclusion of work, the Geotechnical Engineer shall forward five (5) copies of his grouting records, together with five (5) copies, signed and sealed, of the following certificate:

"I have observed all auger-cast piling work on this project. This work has been performed in accordance with the requirements of the specifications, the 2015 IBC, and Good Standard of Practice."

3.8 PILE ACCEPTANCE

A. An auger cast pile will be considered defective if it does not pass tests and inspections or if it is located more than the tolerance from the design location.

1. Replace all abandoned or rejected piles with additional piles as directed by the Architect.
2. Cut off rejected or abandoned piles a minimum of one foot below the bottom elevation of the pile cap.

3.9 PILE TESTING

A. The Contractor shall engage a qualified testing agency to perform pile load tests. The Contractor shall conduct five (5) pre-production pile load tests at locations determined by the Engineer to establish end bearing capacity prior to installation of production piles. See geotechnical report for minimum end bearing requirements.

B. Pre-production piles are sacrificial piles. They are separate from and may not be used as production piles.

END OF SECTION 024660

SECTION 028200
ASBESTOS ABATEMENT

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SECTION 028200

ASBESTOS ABATEMENT SPECIFICATION

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

Drawings, general provisions of the contract, including general and supplementary conditions and other specifications, shall apply to the work of this section. The contract documents show the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial Owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Owner for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Owner shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred due to such action are also the responsibility of the Asbestos Abatement Contractor.

1.1.2 EXTENT OF WORK

A. Below is a brief description of the estimated quantities of asbestos materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
B. Removal, clean-up and disposal of the following asbestos-containing materials (ACM) in appropriately regulated areas:

ACM Description	Material Location	% and Type Asbestos	Estimated Quantity*
Black Tar	Seams on Top of Parapet Walls on Roof of Building 33	5% Chrysotile	100 Square Feet (SF)
Roof Flashing	Roof of Building 33	7-9% Chrysotile	375 SF
Roof	Roof of Building 33	7-9% Chrysotile	5,600 SF
Exterior Window Caulking	Maintenance Garage Windows	<1% Chrysotile	10 SF or 5 Windows

*The Abatement Contractor is solely responsible for determining their opinion of quantities to be removed.

1.1.4 TASKS

The work tasks are summarized briefly as follows:

A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, work-site preparations, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.
B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.
C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES

A. The Abatement Contractor and Abatement Contractor's personnel shall cooperate fully with the Owner and the Owner's representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
B. The Contractor shall use the existing facilities in the buildings strictly within the limits indicated in contract documents. Any variation from the arrangements in contract documents shall be secured in writing from the Owner through the pre-abatement plan of action.

1.2 QUANTITIES

The Abatement Contractor is solely responsible for determining their opinion of quantities to be removed. If additional ACM discovered during the course of abatement, and determined to actually be asbestos-containing as verified through sampling by a certified asbestos inspector and analysis by a NVLAP-accredited laboratory, the Abatement Contractor will be requested by the Owner or Owner's Representative to provide a detailed cost, including an expected duration in hours, for removal of newly discovered ACM.

1.3 STOP ASBESTOS REMOVAL

If the Owner; their field representative; (the facility Safety Officer/Manager or their designee, or the third-party consultant (Owner's Representative) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the Owner shall follow-up with a written order to the Contractor as soon as practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the Owner. A stop asbestos removal order may be issued at any time the Owner or his/her Representative determines abatement conditions/activities are not within specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the Owner and his/her Representative. Standby time and costs for corrective actions will be borne by the Contractor, including the third-party consultant (Owner's Representative) time. The occurrence of any of the following events shall be reported immediately by the Contractor's competent person to the Owner or Owner's Representative using the most expeditious means (e.g., verbal, email, or telephonic), followed up with written notification to the Owner as soon as it is practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

A. Airborne PCM analysis results equal to or greater than 0.05 f/cc outside a regulated area;
B. breach or break in any regulated area containment barrier(s);
C. serious injury/death at the site;
D. fire/safety emergency at the site;
E. respiratory protection system failure;
F. power failure or loss of wetting agent; or

G. any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

1.4.2 GLOSSARY

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition, and renovation activities related to asbestos containing materials (ACM).
Aerosol - Solid or liquid particulate suspended in air.
Adequately wet - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.
Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.
Aggressive sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.
AHERA - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.
Aircell - Pipe or duct insulation made of corrugated cardboard which contains asbestos.
Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 2 is used to determine the fiber levels in air. For personal samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis. NIOSH Method 7402 can be used when it is necessary to confirm fibers counted by PCM as being asbestos. The AHERA TEM analysis may be used for background, area samples and clearance samples when required by this specification, or at the discretion of the Owner and/or Owner's Representative as appropriate.
Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)
Amended water - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.
Asbestos - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.
Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.
Asbestos-containing material (ACM) - Any material containing more than one percent of asbestos.
Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.
Asbestos-contaminated soil (ACS) – Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.
Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos Project Monitor – Some states require that any person conducting asbestos abatement clearance inspections and clearance air sampling be licensed as an asbestos project monitor.
Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.
Authorized person - Any person authorized by the Owner, the Contractor, or Owner's Representative and required by work duties to be present in regulated areas.
Authorized visitor - Any person approved by the Owner; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal and State EPA.
Barrier - Any surface the isolates the regulated area and inhibits fiber migration from the regulated area.
Containment Barrier - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.
Critical Barrier - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.
Primary Barrier – Plastic barriers placed over critical barriers and exposed directly to abatement work.
Secondary Barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.
Breathing zone - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.
Bridging encapsulant - An encapsulant that forms a layer on the surface of the ACM.
Building/facility Owner - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.
Bulk testing - The collection and analysis of suspect asbestos containing materials.
Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.
Class I asbestos work - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).
Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.
Clean room/Changing room - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.
Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the Owner's Representative (professional industrial hygiene consultant).
Closely resemble - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.
Competent person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Count - Refers to the fiber count or the average number of fibers greater than five microns in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace – An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos contaminated soil.

Decontamination area/unit - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

Demolition - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

Disposal bag - Typically 6 mil thick sift-proof, dustproof, leak-tight container used to package and transport asbestos waste from regulated areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

Encapsulant - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

Encapsulation - Treating ACM with an encapsulant.

Enclosure - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

Equipment room - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber - A particulate form of asbestos, 5 microns or longer, with a length to width (aspect) ratio of at least 3 to 1.

Fibers per cubic centimeter (f/cc) - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

Filter - Media used in respirators, vacuums, or other machines to remove particulate from air.

Firestopping - Material used to close the open parts of a structure in order to prevent a fire from spreading.

Friable asbestos containing material - Any material containing more than one (1) percent or asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

High efficiency particulate air (HEPA) filter – An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

HEPA vacuum - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.
Homogeneous area - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.
HVAC - Heating, Ventilation and Air Conditioning
Industrial hygienist (IH) - A professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).
Industrial hygienist technician (IH Technician; Owner's Representative) - A person working under the direction the Owner who has special training, experience, certifications and licenses required for the industrial hygiene work assigned. Some states require that an industrial hygienist technician conducting asbestos abatement clearance inspection and clearance air sampling be licensed as an asbestos project monitor.
Intact - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.
Lockdown - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.
National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR Part 61, Subpart M).
Negative initial exposure assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL's.
Negative pressure - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02" water column gauge inside the negative pressure enclosure.
Negative pressure respirator - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air pressure outside the respirator facepiece.
Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.
Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.
Outside air - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.
Owner/operator - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.
Owner's representative – a third-party industrial hygiene consultant hired by the Owner to oversee abatement work for compliance with applicable federal and state asbestos regulations and this specification.
Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.
Personal protective equipment (PPE) – equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, and respirators.
Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.
Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8 hour time weighted average. For asbestos fibers, the eight (8) hour time weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc) of air and the 30-minute Excursion Limit is 1.0 fibers per cubic centimeter (1 f/cc).
Pipe tunnel – An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the

pipes to access heating elements. These areas may contain asbestos pipe insulation, asbestos fittings, or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type(s) of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator respectively.

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building Owner has actual knowledge or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (b).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH.

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Appendix C, Part I; (B)(5).

Assigned Protection factor - A value assigned by OSHA/NIOSH to indicate the expected protection provided by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

Quantitative fit test (QNFT) - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

Regulated area - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

Regulated ACM (RACM) - Friable ACM; Category I non-friable ACM that has become friable; Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or; Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of the demolition or renovation operation.

Removal - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

Repair - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, fireproofing and other purposes.
Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.
Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.
Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.
Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.
Waste/Equipment decontamination facility (W/EDF) – The area in which equipment is decontaminated before removal from the regulated area.
Waste generator - Any Owner or operator whose act or process produces asbestos-containing waste material.
Waste shipment record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.
Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

The following acronyms or abbreviations as referenced in contract/ specification documents are defined to mean the associated names. Names and addresses may be subject to change.

A. AIHA American Industrial Hygiene Association
2700 Prosperity Avenue, Suite 250
Fairfax, VA 22031
703-849-8888

B. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300

C. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400

D. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420

E. CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900

F. CS Commercial Standard of the National Institute of Standards and Technology (NIST)
U. S. Department of Commerce

Government Printing Office
Washington, DC 20420

G. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949

H. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420

I. NIST National Institute for Standards and Technology
U. S. Department of Commerce
Gaithersburg, MD 20234
301-921-1000

J. NEC National Electrical Code (by NFPA)

K. NEMA National Electrical Manufacturer's Association
2101 L Street, NW
Washington, DC 20037

L. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555

M. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236

N. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Government Printing Office
Washington, DC 20402

O. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.

C. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite.

1.5.2 CONTRACTOR RESPONSIBILITY

The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the asbestos abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment (PPE) including respiratory protection including respirator fit testing, as required by applicable Federal, State and Local regulations. The Contractor shall hold the Owner and third-party consultant (Owner's Representative) harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his subcontractors. The Contractor will incur all costs of the third-party consultant (Owner's Representative), including all sampling/analytical costs to assure compliance with OSHA/EPA/State requirements related to failure to comply with the regulations applicable to the work.

1.5.3 FEDERAL REQUIREMENTS

Federal requirements which govern some aspect of asbestos abatement include, but are not limited to, the following regulations.

A. Occupational Safety and Health Administration **(OSHA)**
   1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
   2. Title 29 CFR 1910.132 - Personal Protective Equipment
   3. Title 29 CFR 1910.134 - Respiratory Protection
   4. Title 29 CFR 1926 - Construction Industry Standards
   5. Title 29 CFR 1910.20 - Access to Employee Exposure and Medical Records
   6. Title 29 CFR 1910.1200 - Hazard Communication
   7. Title 29 CFR 1910.151 - Medical and First Aid

B. Environmental Protection Agency (EPA)
   1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
   2. 40 CFR 763.80 - Asbestos Hazard Emergency Response Act (AHERA)

C. Department of Transportation (DOT)
   Title 49 CFR 100 - 185 – Transportation

1.5.4 STATE REQUIREMENTS

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

1. Code of West Virginia: Chapter 16, Article 32
2. Title Legislative Rule: Division of Health: Series 63: Asbestos Abatement Licensing Rule

1.5.5 LOCAL REQUIREMENTS

If local requirements are more stringent than federal or state standards, the local standards are to be followed.

1.5.6 STANDARDS

A. Standards which govern asbestos abatement activities include, but are not limited to, the following:

1. American National Standards Institute (ANSI) Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI Z88.2 - Practices for Respiratory Protection.
2. Underwriters Laboratories (UL)586-90 - UL Standard for Safety of HEPA filter Units, 7th Edition.

B. Standards which govern encapsulation work include, but are not limited to, the following:
1. American Society for Testing and Materials (ASTM)

C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
3. NFPA 101 - Life Safety Code

1.5.7 EPA GUIDANCE DOCUMENTS

A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.
B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
C. Asbestos Waste Management Guidance EPA 530-SW-85-007
D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

1.5.8 NOTICES

A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:
B. Copies of notifications shall be submitted to the Owner for the facility's records at the same time frame notification is given to EPA, State, and Local authorities.

1.5.9 PERMITS/LICENSES

A. The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

1.5.10 POSTING AND FILING OF REGULATIONS

A. Maintain two (2) copies of applicable federal, state, and local regulations. Post one copy of each at the regulated area where workers will have daily access to the regulations and keep another copy in the Contractor's office.

1.5.11 OWNER RESPONSIBILITIES

Prior to commencement of work:

A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**
B. Submit to the Contractor results of any background air sampling, if available; including location of samples, person who collected the samples, equipment utilized, calibration data and method of analysis. During abatement, submit to the Contractor, results of bulk

material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

C. Provide water and electricity hook-ups for the Contractor to connect to onsite.

1.5.12 SITE SECURITY

A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, Owner employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted at entry to the regulated work area.

B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent person shall immediately notify the Owner.

C. A log book shall be maintained at the entry to the regulated work area. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.

D. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel.

F. The Contractor will have the Owner's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the Owner's employees.

G. The regulated area shall be locked during non-working hours and secured by Owner or Competent Person.

1.5.13 EMERGENCY ACTION PLAN AND ARRANGEMENTS

A. An Emergency Action Plan shall be developed by prior to commencing abatement activities and shall be agreed to by the Contractor and the Owner. The Plan shall meet the requirements of 29 CFR 1910.38 (a);(b).

B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.

C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.

D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.

E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
   1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
   2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.

F. Telephone numbers of any/all emergency response personnel shall be prominently posted at the entry to the regulated work area, along with the location of the nearest telephone.

G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4

minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.

H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos abatement work is stopped and wetting is continued until correction of the problem.

1.5.14 PRE-CONSTRUCTION MEETING

Prior to commencing the work, the Contractor shall meet with the Owner and/or Owner's Representative to present and review, as appropriate, the items following this paragraph. The Contractor's Competent Person(s) who will be on-site shall participate in the pre-start meeting. The pre-start meeting is to discuss and determine procedures to be used during the project.

A. Proof of Contractor licensing.
B. Proof the Competent Person is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person shall also be presented.
C. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101(m).
F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101(h) and Appendix C.
G. A copy of the Contractor's Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project.
    1. Regulated area preparation procedures;
    2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101(d);
    3. If required, decontamination area set-up/layout and decontamination procedures for employees;
    4. Abatement methods/procedures and equipment to be used; and
    5. Personal protective equipment to be used.
H. At this meeting the Contractor shall provide all submittals as required.
I. Procedures for handling, packaging and disposal of asbestos waste.
J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

1.6.1 PERSONNEL

A. Administrative and supervisory personnel shall consist of a qualified Competent Person(s) as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.
B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the Owner's

Representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with color picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.

C. Minimum qualifications for Contractor and assigned personnel are:
   1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of federal (and state as applicable) EPA and OSHA asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work as required by the state; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for asbestos work; and has adequate materials, equipment and supplies to perform the work.
   2. The Competent Person has three (3) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
   4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the standard operating procedures of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; and has certificate of training/current refresher and State accreditation/license.

All personnel should be in compliance with OSHA construction safety training as applicable and submit certification

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with the January 8, 1998 OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.Subpart I;134. ANSI Standard Z88.2-1992 provides excellent guidance for developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written RPP shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c)(1)(i - ix) - Respiratory Protection Program.

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have three (3) years of experience coordinating RPP of similar size and complexity. The RPPC must submit a signed statement attesting to the fact that the program meets the above requirements.

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the Owner as part of the Contractor's qualifications. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available at the entry to the regulated work area for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

Minimum respiratory protection shall be a half face, HEPA filtered, air purifying respirator when fiber levels are maintained consistently at or below 0.1 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

1.7.5 MEDICAL WRITTEN OPINION

No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress

1.7.6 RESPIRATOR FIT TEST

All personnel wearing respirators shall have a current quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Fit tests shall be done for PAPRs which have been put into a failure mode.

1.7.7 RESPIRATOR FIT CHECK

The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a user seal check shall preclude that person from wearing a respirator inside the regulated area until resolution of the problem.

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and care of respirators.

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

1.8.2 MEDICAL EXAMINATIONS

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the medical opinion the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

1.8.3 PERSONAL PROTECTIVE EQUIPMENT

Provide whole body clothing, head coverings, foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle. Worker protection shall meet the most stringent requirements.

1.8.4 REGULATED AREA ENTRY PROCEDURE

The Competent Person shall ensure that each time workers enter the regulated area, they remove ALL street clothes in the designated decontamination area (per OSHA requirements) and put on new disposable coveralls, head coverings, and a clean respirator.

1.8.5 DECONTAMINATION PROCEDURE

The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.

A. When exiting the regulated area, remove all disposable PPE and dispose of in a disposal bag provided in the regulated area.
B. Carefully decontaminate and clean the respirator. Put in a clean container/bag.
C. Where containment is not required for ACM removal, an adequate decontamination/changing/washing station which meets OSHA requirements must be provided for the employees for removal of disposable PPE and to clean the respirator.

1.8.6 REGULATED AREA REQUIREMENTS

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all OSHA requirements for regulated areas at 29 CFR 1926.1101 are met. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES

1.9.1 DESCRIPTION:

Provide each regulated area with adequate 6-mil poly, asbestos labeled disposal bags for personnel waste materials.

1.9.2 WASTE/EQUIPMENT DECONTAMINATION AREA (W/EDA): The Competent Person shall provide a W/EDA for removal of all waste, equipment and contaminated material from the regulated area.

1.9.3 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES: Contain all waste in 6 mil poly bags. Clean/decontaminate bags and pass through into another bag or fiber drum. Remove to disposal dumpster/gondola/vehicle. At no time shall unprotected personnel from the clean side be allowed to enter the regulated area.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)

Prior to the start of work, the contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the

duration of the project. Work shall not start unless the Contractor's Competent Person has verified all necessary materials and equipment are onsite.

A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the Owner in partially occupied buildings by placing materials/equipment in any unauthorized location.
D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
E. As applicable, polyethylene sheeting for any walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mil shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
F. As applicable, the method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the Owner and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
G. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6 mil fire retardant poly.
H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
K. Disposal bags – 2 layers of 6 mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
L. The Owner shall be provided an advance copy of the SDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-project submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.
M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
N. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

2.2.1 GENERAL

Demarcate the regulated work area per OSHA requirements. Any and all HVAC intakes in the regulated area must be covered with 2 layers of 6 mil fire retardant poly. Should

adjacent areas become contaminated, immediately stop work and clean up the contamination at no additional cost to the Owner.

2.2.2 PREPARATION PRIOR TO SEALING THE REGULATED AREA

Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work, or completely cover with 2 layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF), if required. All other means of access shall be eliminated and OSHA Danger demarcation signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly sheeting to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid.

2.2.4 CRITICAL BARRIERS

For outdoor work, if there are any openings into the interior of the building, and for HVAC air intakes, completely separate any openings in the regulated area from adjacent areas using fire retardant poly at least 6 mils thick and duct tape. Individually seal with two layers of 6 mil poly and duct tape any and all HVAC openings and any and all openings to the building interior inside the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly.

2.2.5 SECONDARY BARRIERS:

A loose layer of 6 mil fire retardant poly shall be used as a drop cloth to protect the floor/horizontal surfaces from debris generated during the Class II work, except for floor tile or roofing material abatement. This layer shall be replaced as needed during the work.

2.2.6 EXTENSION OF THE REGULATED AREA

If the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. If the affected area cannot be added to the regulated area, decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

2.3 MONITORING, INSPECTION AND TESTING

2.3.1 GENERAL

A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the Employee exposure to asbestos must not exceed 0.1 fiber per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The Owner's Representative is responsible for and shall inspect and oversee the performance of the Contractor for compliance with this specification and applicable federal and state asbestos regulations. The Owner's Representative shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the Contractor shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA

requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.

B. The Owner will employ an independent a third-party consultant Owner's Representative). The Owner's Representative will perform the necessary monitoring, inspection, testing, and other support services to ensure that employees and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the Owner's Representative consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the Owner's Representative and their services will be borne by the Owner except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.

C. If fibers counted by the Owner's Representative during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the Owner's Representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the Contractor with review and approval of the Owner's Representative . An agreement between the Contractor and the Owner's Representative shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the Contractor and Owner's Representative and delivered to the OWNE.

2.3.2 SCOPE OF SERVICES OF THE OWNER'S REPRESENTATIVE (THIRD-PARTY CONSULTANT)

A. The purpose of the work of the Owner's Representative (Consultant)is to: assure quality; resolve problems; and prevent the spread of contamination beyond the regulated area. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The Consultant may perform the following tasks:
   1. Task 1: May Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
   2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
   3. Task 3: Perform unannounced visits inside the regulated work area to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
   4. Task 4: Provide support to the Owner such as evaluation of submittals from the Contractor, resolution of unforeseen developments, etc.
   5. Task 5: Perform final inspection and testing of a decontaminated regulated area or building at the conclusion of the abatement and clean-up work to certify compliance with all regulations and the Owner requirements/specifications.
   6. Task 6: Issue a final monitoring report.

B. All documentation, inspection results and testing results generated by the Owner's Representative will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the Owner's Representative for efficient and smooth performance of their work.
C. The monitoring and inspection results of the Owner's Representative will be used by the Owner to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

2.3.3 MONITORING, INSPECTION AND TESTING BY CONTRACTOR

The Contractor is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The Contractor is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The analytic laboratory used by the Contractor to analyze the personnel samples shall be AIHA accredited for asbestos PAT and approved by the Owner prior to start of the project. A daily log, shall be maintained by the Contractor , documenting all OSHA requirements for air personal monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the Owner representative and the Owner's Representative upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The Contractor shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift adjacent to the decontamination/changing area shall be collected. In addition to the continuous monitoring required, the Contractor will perform inspection and testing at the final stages of abatement for each regulated area as specified in the Contractor responsibilities. Additionally, the Contractor will monitor and record pressure readings, for negative pressure containments if applicable, daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

The Contractor shall have established Asbestos Hazard Abatement Plan (AHAP) in printed form and loose leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the ways and procedures to be followed during all phases of the work by the Contractor's personnel. The AHAP must be modified as needed to address specific requirements of the project. The AHAP shall be submitted for review and approval prior to the start of any abatement work. The minimum topics and areas to be covered by the AHAP(s) are:

A. Minimum Personnel Qualifications
B. Contingency Plans and Arrangements
C. Security and Safety Procedures
D. Respiratory Protection/Personal Protective Equipment Program and Training
E. Medical Surveillance Program and Recordkeeping
F. Regulated Area Requirements for Abatement
G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
H. Monitoring, Inspections, and Testing
I. Disposal of ACM waste
J. Regulated Area Decontamination/Clean-up

K. Regulated Area Visual and Air Clearance
L. Project Completion/Closeout

2.5 SUBMITTALS

2.5.1 PRE-START MEETING SUBMITTALS

Submit to the Owner a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project:

A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person – see attached for forms.
C. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the Contractor.
D. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
    1. Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.
    2. Waste water filtration system, shower system, containment barriers.
    3. Encapsulants, surfactants, hand held sprayers, airless sprayers, and fire extinguishers.
    4. Respirators, protective clothing, personal protective equipment.
    5. Fire safety equipment to be used in the regulated area.
E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of sub-contractor, if used. Proof of asbestos training for transportation personnel shall be provided.
F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101 (f) and Appendix A. And area or clearance air monitoring in accordance with EPA AHERA protocols.
H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
    1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date
    2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; Resolution
    3. List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including and of the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.

I. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the Competent Person stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
   1. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
   2. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.

J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of AHAP(s) incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and standard operating procedures; and copies of monitoring results of the five referenced projects listed and analytical method(s) used.

K. Rented equipment must be decontaminated prior to returning to the rental agency.

L. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all SDS, and application instructions.

2.5.2 SUBMITTALS DURING ABATEMENT

A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breeching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWAs/ELs. Submit this information daily to the Owner’s Representative.

B. The Owner’s Representative shall document (written logs) and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The Contractor shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the regulated work areas and transportation of waste from the work areas with applicable Chain of Custody forms. All personnel air sample results shall be included. The report shall include a certificate of completion, signed and dated by the Contractor in accordance with Attachment #1 (see attached).

PART 3 - EXECUTION

3.1 PRE-ABATEMENT ACTIVITIES

3.1.1 PRE-ABATEMENT MEETING

The Owner's Representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the Contractor that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the Competent Person(s), the Owner's representative(s), and the Owner. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/documentation to the Owner's Representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the Owner's will issue a written order to proceed to the Contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the Owner's written order to proceed.

3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

Before any work begins on the construction of the regulated area, the Contractor will:

A. Conduct a space-by-space inspection with the Owner and Owner's Representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed as accurate by the Owner and the Contractor.
B. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.
C. If present and required, remove and dispose of carpeting from floors in the regulated area.

3.1.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
B. Upon completion of all preparatory work, the Contractor will inspect the work and systems and will notify the Owner's Representative when the work is completed in accordance with this specification. The Owner's Representative may inspect the regulated area and the systems with the Contractor and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved SOP's, especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation.
C. The Contractor shall document the pre-abatement activities described above and include in the final report documentation.
D. Upon satisfactory inspection of the installation of and operation of systems the Owner's Representative will notify the Contractor to proceed with the asbestos abatement work in accordance with this specification.

3.2 REGULATED AREA PREPARATIONS

3.2.1 OSHA DANGER SIGNS

Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.

3.2.2 SHUT DOWN - LOCK OUT ELECTRICAL

Shut down and lock out/tag out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the Owner.

3.2.3 SHUT DOWN - LOCK OUT HVAC

Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area.

Investigate the regulated area and agree on pre-abatement condition with the Owner's Representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of 6-mil poly. Also, seal any seams in system components that pass through the regulated area. If present, remove all contaminated HVAC system filters and place in labeled 6-mil poly disposal bags for disposal as asbestos waste.

3.2.4 SANITARY FACILITIES

The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

3.2.5 WATER FOR ABATEMENT

The Owner will provide water for abatement purposes. The Contractor shall connect to the existing Owner’s system. The service to the regulated work area shall be supplied with backflow prevention.

3.2.6 PRE-CLEANING MOVABLE OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location.

3.2.7 PRE-CLEANING FIXED OBJECTS

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. Careful attention must be paid to machinery behind grills or gratings where access may be difficult, but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After pre-cleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

3.2.8 PRE-CLEANING SURFACES IN THE REGULATED AREA

Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. PPE must be donned during all pre-cleaning activities. Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

3.3 BARRIERS AND COVERINGS FOR THE REGULATED AREA

3.3.1 GENERAL

The perimeter of the regulated area shall meet and be clearly demarcated per OSHA requirements. Two layers of 6 mil fire retardant poly shall be used to cover any openings into the interior of the building and any HVAC air intakes to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated, immediately stop work and clean up the contamination at no additional cost to the Owner.

3.3.2 PREPARATION PRIOR TO SEALING OFF

Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work, or completely cover with 2 layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

3.3.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area is allowed only through the personnel decontamination facility (PDF), if required. All other means of access shall be eliminated and OSHA Danger demarcation signs posted as required by OSHA. If the regulated area is adjacent to or within view of an occupied area, provide a visual barrier of 6 mil opaque fire retardant poly sheeting to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid.

3.3.4 CRITICAL BARRIERS

Completely separate any openings in the regulated work area from the interior of the building using fire retardant poly at least 6 mils thick and duct tape. Individually seal with 2 layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly.

3.3.5 EXTENSION OF THE REGULATED AREA

If the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. If the affected area cannot be added to the regulated area, decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

3.3.6 FLOOR BARRIERS

If floor/roof removal is not being done, all floors in the regulated area shall be covered with 2 layers of 6 mil fire retardant poly and brought up the wall 12 inches.

3.4 REMOVAL

3.4.1 GENERAL

The Owner must be notified at least 24 hours in advance of any waste removed from the containment. All applicable requirements of OSHA, EPA, and DOT shall be followed during removal. Keep materials intact; do not disturb; wet while working with it; wrap as soon as possible with 2 layers of 6 mil plastic for disposal.

WETTING ACM

A. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure the wetting of ACM meets the definition of "adequately wet" in the EPA NESHAP regulation and OSHA's "wet methods" for the duration of the project. A removal encapsulant may be used instead of amended water with written approval of the Owner.
B. Amended Water: Provide water to which a surfactant has been added shall be used to wet the ACM and reduce the potential for fiber release during disturbance of ACM. The mixture must be equal to or greater than the wetting provided by water amended by a surfactant consisting one ounce of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with 5 gallons (19L) of water.
C. Removal Encapsulant: When authorized by Owner, provide a penetrating encapsulant designed specifically for the removal of ACM. The material must, when used, result in adequate wetting of the ACM and retard fiber release during removal.

3.4.2 OUTDOOR WORK AREAS

If outdoor work is to be performed, all applicable OSHA, state and local regulations must be followed to ensure that outdoor work areas are in compliance so that workers, the general public and the environment are protected.

3.4.3 SCAFFOLD FALL PROTECTION

Each employee more than 10 feet above a lower level shall be protected from falls by guardrails or a fall arrest system. Fall arrest system includes harnesses, components of the harness/belt such as Dee-rings, and snap hooks, lifelines, and anchorage points. Lifelines must be independent of supports lines and suspension ropes and not attached to the same anchorage point as the support or suspension rope. OSHA's scaffolding standard defines a competent person as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous to employees, and who has authorization to take prompt corrective measures to eliminate them." The competent person will determine if it is safe for employees to work on or from a scaffold or roof during storms or high winds and to ensure that a personal fall arrest system will protect the employees. The competent person will also inspect the scaffold and scaffold components for visible defects before each work shift and after any occurrence which could affect the structural integrity and to authorize prompt corrective measures.

3.4.4 ROOF FALL PROTECTION

The competent person shall determine if the walking/working surfaces on which the employees are to work have the strength and structural integrity to support the employees safely. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest system.

3.4.5 REMOVAL OF ROOFING MATERIALS

A. Roofing material shall be removed in an intact state to the extent that it is feasible.
B. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards
C. Cutting machines shall be continuously misted during use, unless a competent person determines that misting substantially decreases worker safe
D. When removing built-up roofs with asbestos-containing roofing felts and an aggregate surface using a power roof cutter, all dust resulting from the cutting operation shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line. When removing built-up roofs with asbestos-containing roofing felts and a smooth surface using a power roof cutter, the dust resulting from the cutting operation shall be collected either by a HEPA dust collector or HEPA vacuuming along the cut line, or by gently sweeping and then carefully and completely wiping up the still-wet dust and debris left along the cut line.
E. Asbestos-containing material that has been removed from a roof shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground via covered, dust-tight chute, crane or hoist
F. Any ACM that is not intact shall be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift. While the material remains on the roof it shall either be kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting
G. Intact ACM shall be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift
H. Upon being lowered, unwrapped material shall be transferred to a closed receptacle in such manner so as to preclude the dispersion of dust
I. Roof level heating and ventilation air intake sources shall be isolated or the ventilation system shall be shut down.
J. Notwithstanding any other provision of this section, removal or repair of sections of intact roofing less than 25 square feet in area does not require use of wet methods or HEPA vacuuming as long as manual methods which do not render the material non-intact are used to remove the material and no visible dust is created by the removal method used. In determining whether a job involves less than 25 square feet, the employer shall include all removal and repair work performed on the same roof on the same day.

   All waste must be wrapped in two layers of 6 mil poly and lowered carefully to the ground. Roofing may be lowered by way of a dust-tight chute.

3.2.7 REMOVAL OF EXTERIOR GLAZING/CAULKING MATERIALS

A. Asbestos-containing glazing / caulking shall be removed wet and utilizing hand tools. Mechanical removal means is strictly prohibited.
B. Areas shall be properly demarcated per OSHA during all work activities. Install poly barriers consisting of 2 layers of 6 mil polyethylene sheeting on the interior side of the window or door opening. Proper OSHA asbestos warning demarcation must be installed on each barrier.
C. Place two layers of 6 mil polyethylene sheeting beneath all window and/or door work to act as a “drop cloth”. Drop clothes must be secured with tape to prevent slip hazards and must extend a minimum of 8 feet in all possible horizontal directions beneath the extent of the work area.
D. Wet with amended water and remove asbestos glazing/caulking/wood framing using hand tools while attempting to minimize disturbance to the caulking material.

E. All wetted asbestos-containing waste glazing/caulking, and wood with attached material, must be immediately bagged for disposal, and shall not be allowed to dry-out and accumulate within the work area.
F. All sharp objects attached to framing, such as nails or sharp wooden ends shall be removed prior to placing in disposal bags or being wrapped such that they do not puncture disposal containers as well as preventing injuries. Sharp objects which may have asbestos caulking attached must be cleaned of any caulking prior to proper disposal.
G. All wetted glazing/caulking waste shall be placed in two 6 mil polyethylene asbestos disposal bags. Larger objects (i.e. wood framing) which will not fit into disposal bags shall be double wrapped (individually sealed) with two layers of 6 mil polyethylene sheeting. All bags/wrapped components must bare appropriate EPA/OSHA/DOT required labels.
H. The Contractor shall remove, with wet methods (amended water), all residual asbestos-containing glazing/caulking which may adhere to the building's exterior surface/façade around window and/or door openings.
I. Exterior surfaces such as window sills, including equipment {e.g. scaffolding} shall be HEPA vacuumed and wet wiped.
J. Windows/door openings that remain shall be cleaned of all residual asbestos-containing caulk. Windows/door openings which have been HEPA vacuumed and wet-wiped, must be determined by the Competent Person to be visually free of asbestos-caulking and associated debris.
K. All polyethylene "drop cloths" must be HEPA vacuumed first and then placed in two 6 mil polyethylene disposal bags.
L. The grounds beneath all work must be checked for debris that may have become dislodged during removal. All such debris must be properly wetted and placed in disposal bags as asbestos-containing.
M. The Contractor's Competent Person shall ensure the work area, including the exterior immediate grounds, are kept clean at all times and free of accumulated debris, as well as safety/trip hazards.

3.5 DISPOSAL OF WASTE MATERIAL

3.5.1 GENERAL

Any waste stored temporarily onsite prior to being transported to the landfill, must be stored in a fully enclosed, locked container and labeled according to all applicable federal, state, and local regulations. No open top storage or dumpsters shall be permitted.

Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100–185 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.6 PROJECT DECONTAMINATION

3.6.1 GENERAL

A. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the Contractor's Competent Person.
B. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
C. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior

to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.6.2 REGULATED AREA CLEARANCE

Visual inspection and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

3.6.3 WORK DESCRIPTION

Decontamination includes the cleaning and clearance of the air in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF and W/EDF facilities.

3.6.4 PRE-DECONTAMINATION CONDITIONS

A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removal and disposed of along with any gross debris generated by the work.
B. At the start of decontamination, the following shall be in place:
   1. Critical barriers over all openings consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
   2. Decontamination facilities, if required for personnel and equipment in operating condition.

3.6.5. CLEANING

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the Owner's Representative.

3.7 VISUAL INSPECTION AND AIR CLEARANCE TESTING

3.7.1 GENERAL

Notify the Owner's Representative 24 hours in advance for the performance of the final visual inspection and any testing, if required. The final visual inspection and testing (if required) will be performed by the Owner's Representative after the cleaning.

3.7.2 VISUAL INSPECTION

Final visual inspection will include the entire regulated area, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the cleaning shall be repeated at no cost to the Owner. Dust/ material samples may be collected and analyzed at no cost to the Owner at the discretion of the Owner's Representative to confirm visual findings. When the regulated area is visually clean the final testing, if applicable, can be done.

3.7.3 AIR CLEARANCE TESTING

A. For outdoor work, air clearance testing is not required. However, the Contractor must meet the Owner's Representative final visual inspection approval. The Contractor and

the Owner's Representative will sign and complete a final visual inspection acceptance form (to be provided the Owner's Representative and included in the final report by the Owner's Representative. monitoring

3.8 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.8.1 COMPLETION OF ABATEMENT WORK

A. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria (visual inspection clearance) and fulfilling the following:
   1. Remove all equipment, materials, and debris from the project area.
   2. Package and dispose of all asbestos waste as required.
   3. Repair or replace all interior finishes damaged during the abatement work.
   4. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.8.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

The Contractor shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated areas.

3.8.3 WORK SHIFTS

All work shall be done during administrative hours (8:00 AM to 4:30 PM) Monday - Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the Owner.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ Owner's Project #: _____

PROJECT NAME: _____ Abatement Contractor: _____

ADDRESS: _____

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):

   which took place from / / to / /

2. That throughout the work all applicable requirements/regulations and the specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and Owner specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all abatement work was done in accordance with OSHA requirements and the manufacturer's recommendations.

Contractor Signature/Date: _____

Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME:_____ DATE: _____

PROJECT ADDRESS:_____

ABATEMENT CONTRACTOR'S NAME:_____

_____

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate, you are indicating to the Owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32 hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

Physical Characteristics and Background Information on Asbestos
Potential Health Effects Related to Exposure to Asbestos
Employee Personal Protective Equipment
Establishment of a Respiratory Protection Program
State of the Art Work Practices
Personal Hygiene
Additional Safety Hazards
Medical Monitoring
Air Monitoring
Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature:_____

Printed Name:_____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

PROJECT NAME AND NUMBER:_____

FACILITY:_____

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:_____

1. I verify that the following individual

   Name:_____

   who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101 (m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

   Address:_____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the specifications.

Signature of Contractor:_____ Date:_____

Printed Name of Contractor:_____

ATTACHMENT #4

ABATEMENT CONTRACTOR REVIEW AND ACCEPTANCE OF THE OWNER'S ASBESTOS SPECIFICATIONS

Project Location:_____

Owner's Project #:_____

Project Description:_____

This form shall be signed by the Asbestos Abatement Contractor prior to any start of work at the site related to this Specification. If the Asbestos Abatement Contractor has not signed this form, they shall not be allowed to work on-site.

I, the undersigned, have read the Asbestos Abatement Specification regarding the asbestos abatement requirements. I understand the requirements of the Owner's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the Asbestos Abatement Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the Asbestos Abatement Specification.

At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the Asbestos Abatement Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Signature_____Date_____

Abatement Contractor Printed Name_____

- - END - -

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Trial mixes must be conducted at or near the specified tolerances for slump and air content. Trial mix strength tests shall be a 1, 3, 7, 14 and 28 days. Mix design submittals will not be reviewed without 28 day test results.
2. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

F. Material Certificates: Signed by manufacturers and Contractor certifying that each of the following items complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.5 QUALITY ASSURANCE

Codes and Standards: Comply with provisions of the current editions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301, "Specifications for Structural Concrete for Buildings."
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

B. Testing Agency Qualifications: Contractor shall engage an independent testing agency, acceptable to Architect, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as a Portland Cement Concrete Technician by the West Virginia Department of Transportation.
2. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60/Grade 420, deformed.

B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

C. Plain-Steel Wire: ASTM A 82 as drawn.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
2. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or III.

1. Fly Ash: ASTM C 618, Class C or F.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded.

C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Products: Subject to compliance with requirements, products that may be incorporated in the work include the following:

a. "Air-Mix" or "Perma-Air," Euclid Chemical Co.
b. "Darex AEA" or "Daravair," W.R. Grace & Co.
c. "MB-VR" or "Micro-Air," Master Builders, Inc.

B. Water-Reducing Admixture: ASTM C 494, Type A.

1. Products: Subject to compliance with requirements, products that may be incorporated in the work include the following:

a. "Eucon WR-75," Euclid Chemical Co.
b. "WRDA," W.R. Grace & Co.
c. "Pozzolith Normal" or "Polyheed," Master Builders, Inc.

2.6 RELATED MATERIALS

A. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217 inch thick (26-gage) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:

1. Polyethylene sheet not less than 10 mils thick.
2. See floor covering specifications for compatibility with materials.

C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.7 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 20 percent.

D. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Engineer.

E. Design mixes to provide normal weight concrete with the properties as indicated on the structural drawings.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

G. Air Content: as indicated on the structural drawings.

H. Do not air entrain concrete to trowel-finished interior floors. Do not allow entrapped air content to exceed 3 percent.

I. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

J. Admixtures: Use admixtures for water reduction in strict compliance with manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.10 CONCRETE CURING AGENT

A. Concrete Curing Agent: Laticrete International, Inc, "L&M Cure", or equal. Water based blend of sodium, potassium and meta silicates to cure concrete, leaving concrete surfaces membrane free and ready to receive subsequent toppings, coatings, or penetrating treatments, leaving concrete stain free and residue free.

2.11 CONCRETE DENSIFYER AND SEALER (at sealed concrete floors)

A. Concrete Densifying Agent: Laticrete International, Inc, "LiON HARD", or equal. UV stable, penetrating, skid resisatant, VOC-free lithium silicate concrete floor densifier, hardener and breathable sealer.

B. Concrete Sealing Agent; Laticrete International, Inc, "Petrotex", or equal. Quick drying, water-based, low VOC emulsion of silane, siloxane and synthetic polymers that protect chemically hardened concrete to resist the penetration of water and oil, without film or changing the color of the concrete.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. At least 70 percent of 28-day design compressive strength.

3.4 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.

C. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

F. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system

2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, walks, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise specified.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: L & M CURE or equal. Prepare, apply, and finish placement of curing compound according to manufacturer's written instructions.
4. Penetrating Liquid Floor Densifying Treatment at sealed concrete: L & M LiON HARD or equal. Allow the concrete to cure a minimum of 28 days, then clean

concrete and, prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

5. Oil and Water Repellant Sealing Coat at sealed concrete: L & M PETROTEX or equal. Clean concrete and, prepare, apply, and finish protective sealing coat according to manufacturer's written instructions.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer

according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer’s approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer’s approval.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified independent testing and inspection agency to sample materials, perform tests and inspections, and submit test reports during concrete placement according to requirements specified in this Article and the Special Inspections Specification.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for

each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

    a. Test two field-cured specimens at 7 days and two at 28 days.
    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

E. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

END OF SECTION 033000

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Grout.

B. Related Sections include the following:

1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 9 Section "High-Performance Coatings" for surface preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using AISC's "Manual of Steel Construction, Allowable Strength Design," Part 4.
2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualifications Data: For firms and persons specified in the "Quality Assurance" article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners and other information specified.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Nonshrink grout.
6. Shop primers.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC’s “Seismic Provisions for Structural Steel Buildings” and “Supplement No. 2.”

3. AISC's "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design".
4. AISC's Specification for the Design of Steel Hollow Structural Sections."
5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
6. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
7. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.

B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
4. Finish: Plain.

C. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Plain.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, rust-inhibiting primer.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design."

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish (all exterior steel): Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.8 SOURCE QUALITY CONTROL

A. Contractor shall hire an independent testing and inspecting agency to inspect shop welds and high-strength bolted connections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Shop-welded connections will be visually inspected according to AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Load and Resistance Factor Design Specification for Structural Steel Buildings."

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Contractor shall hire an independent testing and inspecting agency acceptable to Architect to inspect field welds and high-strength bolted connections.

B. Bolted and Welded Connections: Field welds and bolted connections will be visually inspected according to AWS D1.1.

C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories**,** bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

B. Galvanized Surfaces (exterior steel): Cleanfield welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 05120

SECTION 055210 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel pipe railings.

B. Related Sections:

1. Division 9 Section “Exterior Painting” for painting of railings.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of West Virginia, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of finishing and connecting members at intersections.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional engineer shall be licensed in the State of West Virginia.

F. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

G. Welding certificates.

H. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.

B. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

C. Post-Installed Anchors: Chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 9 Painting Sections.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage**,** but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

F. Connections: Fabricate railings with welded connections unless otherwise indicated.

G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

H. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

I. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. By bending.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide painted galvanized plates for connecting railings to concrete or masonry work. Fabricate plates with stainless steel bolted connections capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

A. For non-galvanized steel railings, provide non-galvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer.
2. Do not apply primer to galvanized surfaces.

D. Shop-Painted Finish: Comply with Division 9 Section "Interior Painting." Division 9 Section "High-Performance Coatings."

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

A. Anchor posts to metal surfaces as indicated on the drawings.

B. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

3.5 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05521

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Utility shelving.
6. Plywood backing panels.

B. Related Sections include the following:

1. Division 2 Section "Termite Control" for site application of borate treatment to wood framing.

2. Division 6 Section “Sheathing.”

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated or used. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Dimension lumber framing.
2. Laminated-veneer lumber.
3. Parallel-strand lumber.
4. Rim boards.
5. Miscellaneous lumber.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, which meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: Where indicated or required, AWPA C2**,** except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.
5. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir; WCLIB, or WWPA.
3. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

E. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

F. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

G. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

H. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANEL

A. Telephone and Electrical Equipment Backing Panels, where indicated or required: DOC PS 1, Exposure 1, C-D Plugged**,** in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 METAL FRAMING ANCHORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

1. Cleveland Steel Specialty Co.
2. Harlen Metal Products, Inc.
3. KC Metals Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. Southeastern Metals Manufacturing Co., Inc.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations where stainless steel is not indicated.

D. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.062 inch (1.6 mm)].

E. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: 1-1/2 inches (38 mm).
2. Thickness: 0.062 inch (1.6 mm).

G. Bridging: Rigid, V-section, nail less type, 0.050 inch (1.3 mm) thick, length to suit joist size and spacing.

H. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.

I. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: 3/4 inch (19 mm).
2. Thickness: 0.062 inch (1.6 mm).
3. Length: 16 inches (400 mm).

J. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall sill below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated or where required as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- (38-mm actual-) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD GROUND, SLEEPER**,** BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally at 24 inches (610 mm) o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction, unless otherwise indicated.

1. For exterior walls provide 2-by-6 inch normal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-4-inch nominal- size wood studs spaced 16 inches o.c., unless otherwise indicated.

3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet (3 to 3.6 m) in width.
2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R502.5 (1) or Table R502.5 (2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings].

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:

1. Where supported on wood members or wood sills by using metal framing anchors.
2. Where framed into wood supporting members, if not indicated, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

F. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to 3 joists. Embed anchors at least 4 into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

G. Provide solid blocking between joists under jamb studs for openings.

H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

I. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

1. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.7 DECK FRAMING INSTALLATION

A. General: provide pressure preservative treated lumber for all components of front and rear decks.

B. Attach ledger board to foundation wall as indicated on the drawings.

C. Install 2x6 decking with crown side up.

D. Fasten decking to joists and beams with screws.

3.8 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Stringer Size: 2-by-12-inch nominal- (38-by-286-mm actual-) size, minimum.
2. Notching: Notch stringers to receive treads, risers, and supports; leave at least 3-1/2 inches (89 mm) of effective depth.
3. Stringer Spacing: At least 3 stringers for each 36-inch (914-mm) clear width of stair.

B. Provide stair framing with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

3.9 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes self-adhering modified bituminous sheet waterproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Basis of Design is CCW MiraDRI Sheet Membrane Waterproofing by Carlisle Coatings and Waterproofing Incorporated.

2. Equivalent products from but, not limited to the following manufacturers may be incorporated into the work:

a. Grace Construction Products; Bituthene
b. W. R. Meadows, Inc.; SealTight Mel-Rol
c. Pecora Corporation; Duremem

3. Physical Properties:

    a. Tensile Strength, Membrane: 325 psi minimum; ASTM D 412, Die C, modified.
    b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
    c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
    d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
    e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
    f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
    g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
    h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

4. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid solvent-borne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

G. Protection Course: ASTM D 6506, semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
1. Thickness: 1/8 inch (3 mm), nominal, for vertical applications; 1/4 inch (6 mm), nominal, elsewhere.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, non-biodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

PART 3 - EXECUTION

3.1 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Prepare surfaces and install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet-waterproofing terminations with mastic.

F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

H. Immediately install protection course with butted joints over waterproofing membrane.

1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.2 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to

maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install protection course before installing drainage panels.

3.3 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.

2. Glass-Fiber Blanket insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 FOUNDATION AND PERIMETER INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
1. Provide Dow Chemical Company STYROFOAM Brand Square Edge (SE) or approved equal.
2. Type IV, 25 psi (173 kPa) minimum.
3. Thermal resistance: 5-year aged R-values of 5.4 and 5.0 minimum; degrees F x h x sq. ft. /Btu x in. at 40 degrees and 75 degrees respectively per ASTM C 518-91.
4. Water absorption: Maximum 0.3% by volume (ASTM C 272-91).
5. Thickness: 2 inches minimum and in multiples as required to achieve thickness indicated on drawings.

2.2 ADHESIVES

A. Use type and brand recommended by insulation manufacturer for the application indicated.

2.3 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

Sound Insulation: Units specifically manufactured and marked for use as sound attenuation blankets.
1. CertainTeed Corporation
2. Johns Manville
3. Owens Corning

B. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. CertainTeed Corporation

2. Johns Manville

3. Owens Corning

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF BELOW-GRADE PERIMETER INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:

    a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward interior of construction.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume.

3.4 INSULATION SCHEDULE

A. Insulation Type: Perimeter and Foundation Wall Insulation - Type IV, Extruded-polystyrene board insulation, 3” thick.

B. Insulation Type: Sound Batt Insulation - Unfaced, glass-fiber blanket insulation, 3-1/2” thick.

C. Insulation Type: Stud Walls and Miscellaneous Batt Insulation – Unfaced, glass-fiber blanket insulation, provide thickness as required to fill cavity, R-13 minimum.

D. Insulation Type: Fire Safing Insulation – See Division 7 “Fire Resistive Joint Systems.”

END OF SECTION 072100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

B. Product test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by UL, FM Global, or a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to the systems indicated and are produced by the following manufacturers:
1. 3M; Fire Protection Products Division.
2. Grace, W. R. and Co.
3. Hilti Inc.
4. Tremco; Sealant/Weatherproofing Division.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

D. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.

3.3 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.4 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Firestopping for Metallic Pipes, Conduit, or Tubing:

1. UL-Classified Systems: C-AJ-1404/1406/1426

C. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:

1. UL-Classified Systems: C-AJ-2401/2172/2201/2376/2251

D. Firestopping for Electrical Cables:

1. UL-Classified Systems: C-AJ-3136/3153/3199/3185/3189

E. Firestopping for Cable Trays with Electric Cables:

1. UL-Classified Systems: C-AJ-4038/4053.

F. Firestopping for Insulated Pipes:

1. UL-Classified Systems: C-AJ-5008/5114/5152/5164/5226/5271

G. Firestopping for Miscellaneous Electrical Penetrants:

1. UL-Classified Systems: C-AJ-8101/8133

H. Firestopping for Miscellaneous Mechanical Penetrants:

1. UL-Classified Systems: C-AJ-7008/7038/7067

I. Firestopping for Groupings of Penetrants:

1. UL-Classified Systems: C-AJ-8101/8133

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

B. Product test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by UL or a qualified testing agency acceptable to authorities having jurisdiction.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

C. Joints in Smoke Barriers: Ratings determined per UL 2079.

1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.

D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

F. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

H. Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to the systems indicated and are produced by the following manufacturers:

1. 3M; Fire Protection Products Division.
2. Grace, W. R. and Co.
3. Hilti Inc.
4. Tremco; Sealant/Weatherproofing Division.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.4 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.

B. Floor-to-Floor, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FF-D-0027/0034.

C. Wall-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems, where movement is anticipated: WW-D-0004/0030.

2. UL-Classified Systems, static locations: WW-S-0008/0028.

D. Floor-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FW-D-0004/0012.

E. Head-of-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D-0206/0013.

F. Bottom-of-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: BW-S-0007.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction laboratory test reports.

C. Preconstruction field-adhesion-test reports.

D. Field-adhesion-test reports.

E. Sample warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry and precast concrete substrates.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

B. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, non-traffic use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT:

1. Tremco Spectrem2
2. Sikasil WS-290
3. Equivalent products of the other manufacturers approved by Architect.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, non-traffic use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses NT:

1. Tremco Dymonic
2. Sikaflex Construction Sealant
3. Equivalent products of other manufacturers approved by Architect.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT:

1. Tremco Dymonic
2. Sikaflex Self-Leveling
3. Equivalent products of other manufacturers approved by Architect.

C. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and non-traffic use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT:

1. Tremco Vulkem 45 SSL
2. Sikaflex-2C SL
3. Approved equals of other manufacturers approved by Architect.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, non-traffic use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Tremco Temsil 200
2. Sikasil GP
3. Equivalents of other manufacturers approved by Architect.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Sherwin Williams 950A
2. Equivalents of other manufacturers approved by the Architect.

2.6 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Material and type as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation and contraction joints in cast-in-place concrete slabs.
b. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, P, 50, T.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in dimension stone cladding.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, non-staining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Vertical joints on exposed surfaces of unit masonry or concrete walls and partitions.
d. Joints on underside of plant-precast structural concrete beams and planks.

e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Provide Tremco Butyl Sealant or equivalent of another manufacturer approved by Architect.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint Sealant Application: Acoustic control.
1. Joint Locations:
a. Acoustic door frames
b. Non fire rated penetrations in walls of rooms indicated on the drawings as sound barriers.
2. Joint Sealant: Synthetic Rubber based.
3. Provide Tremco Acoustical Sealant or equivalent of another manufacturer approved by Architect.

END OF SECTION 079200

SECTION 081114 - STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Sections include the following:

1. Section 088000 "Glazing" for glazed lites in standard steel frames.
2. Section 087100 “Door Hardware.”
3. Sections 099000 “Exterior Painting” and 090600 “Interior Painting” for field painting standard steel doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Details of glazing frames and stops showing glazing.
8. Details of conduit and preparations for electrified door hardware and controls.

C. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

D. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

B. Fire-Rated Door Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.
2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an ASSA ABLOY Group Company.
3. Republic Builders Products Company.
4. Steelcraft; an Ingersoll-Rand Company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) zinc-iron-alloy (galvannealed) coating designation.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

G. Grout: Comply with ASTM C 476, with a slump of 4 inches (102 mm) for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 8 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W) when tested according to ASTM C 1363.

        1) Locations: Exterior doors and as noted on drawings.

3. Vertical Edges for Single-Acting Doors: Square edge.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch (3.0 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.

3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet, unless otherwise indicated.
3. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch (3.0 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick.

E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

F. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.5 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch (16 mm) high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.6 FABRICATION

A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Steel Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
3. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
4. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Two anchors per jamb up to 60 inches (1524 mm) in height.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) in height.

4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof more than 120 inches (3048 mm) in height.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of doors and frames.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.7 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils (0.018 mm).

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames: Install standard steel frames for doors and other openings, of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
5. In-Place Gypsum Board Partitions: Secure frames in place with post installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with standard steel door and frame manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c., and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081114

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 081114 “Standard Steel Doors and Frames” for Hollow Metal Frames.
2. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish**.** For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

    a. Provide Samples for each species of veneer and solid lumber required.
    b. Provide Samples for each color, texture, and pattern of plastic laminate required.
    c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificates: AWI Quality Certification WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 17 and 50 percent during remainder of construction period.

1.9 WARRANTY

A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. General Veneer Manufacturing Co.
2. Graham Wood Doors; ASSA ABLOY Group Company.
3. Marlite.
4. Mohawk Flush Doors, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.
2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

C. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

D. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware as follows:

a. 5-inch top-rail blocking, in doors indicated to have closers.
b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
c. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

E. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: Hard Maple.
3. Cut: Rift cut.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Exposed Verticaland Top Edges: Same species as faces or a compatible species - edge Type A.
8. Core: Particleboard.
9. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Recessed tapered beads.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: Custom.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087110 "Door Hardware (Descriptive Specification)."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise

indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details**,** material descriptions, dimensions of individual components and profiles, and finishes.

B. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Aluminum Flush Access Doors:

1. Manufacturers include ACUDOR Products Inc, Cendrex Inc, MIFAB Inc, Milcor, Williams Bros. Corporation.
2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Optional Features: Piano hinges.
4. Locations: Wall.
5. Door Size: 24”x24”.
6. Aluminum Sheet for Door: Nominal 0.045 inch minimum, with mill finish.
7. Frame Material: Same material, thickness, and finish as door.
8. Latch and Lock: Latch bolt, knurled-knob operated.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063.

B. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Frame Anchors: Same material as door face.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

D. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
2. Show locations of controls, locking devices detectors or replaceable fusible links, and other accessories.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings.

2.2 EXTERIOR DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats, basis of design product, Overhead Door Corporation, Model 625 Stormtite.

1. Overhead Door Corporation, Basis of Design.
2. Raynor.
3. Wayne-Dalton Corporation

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000.

C. Curtain R-Value: R-7.7 (1.35 W/Msq).

D. Door Curtain Material: Galvanized Steel.

E. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.

1. Vision Panels: Approximately 10- by 1-5/8-inch (254- by 41-mm) openings spaced approximately 2 inches (51 mm) apart and beginning 12 inches (305 mm) from end guides; in rows of slats at heights indicated on Drawings; installed with insulated vision-panel glazing.
2. Insulated-Slat Interior Facing: Metal.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from aluminum extrusions and finished to match door.

G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

H. Hood: Galvanized steel.

1. Mounting: Face of wall.

I. Locking Devices: Equip door with locking device assembly and chain lock keeper.

1. Locking Device Assembly: Slide bolt, both jamb sides, operable from inside.

J. Electric Door Operator:

1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day. Basis of design, Overhead Door Corporation RHX.
2. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
3. Motor Exposure: Exterior, wet, and humid.
4. Motor Electrical Characteristics:

   a. Horsepower: 3/4 hp.
   b. Voltage: 208-V ac, three phase, 60 Hz.

5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
7. Control Station(s): Interior mounted.
8. Other Equipment: Portable radio-control system, with two controllers per door.

K. Curtain Accessories: Equip door with weatherseals and automatic-closing device.

L. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer’s full range of colors.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection-rated glass as required for type of door; set in glazing channel secured to curtain slats.
2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.

3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm) and minimum aluminum thickness of 0.032 inch (0.80 mm).
4. Plastic Interior Curtain-Slat Facing: Extruded PVC plastic with maximum flame-spread index of 25 and smoke-developed index of 450, according to ASTM E 84 or UL 723.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent over travel of curtain.

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Door and Interior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

B. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2.8 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

D. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

E. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

F. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

G. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

H. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084213 - ALUMINUM-FRAMED ENTRANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Requirements:

1. Section 088000 “Glazing”

1.2 SUMMARY

A. Section Includes:

1. Exterior manual-swing entrance doors and door-frame units.
2. Sidelite and Transoms.

1.3 ALLOWANCES

A. Field quality-control testing is part of testing and inspecting allowance.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.

c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For aluminum-framed entrances, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance.

C. Product Test Reports: For aluminum-framed entrances.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.

C. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

D. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Entrance Doors:

    a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

E. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

F. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.44 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K**)** as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 57 as determined according to NFRC 500.

G. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 30.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; an Alcoa company; AA425 Thermally Broken Entrance w/ 4-1/4” Stile and Top Rail and 10” Bottom Rail or a comparable product by one of the following, or equal:

1. EFCO Corporation.
2. Oldcastle BuildingEnvelope™.
3. YKK AP America Inc.

2.3 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-1/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Stile; 4-1/4", Top Rail; 4-1/4", Bottom Rail; 10"
3. Glazing Stops and Gaskets: Beveled snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Framing Members: Provide Kawneer Trifab 451T or equal framing members, see section 084113 "Aluminum Framed Entrances and Storefronts".

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087110 "Door Hardware."

B. General: Provide entrance door hardware for each entrance door to comply with requirements below.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products, complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

3. Opening-Force Requirements:

    a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N)to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
    b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
2. Exterior Hinges: Stainless steel, with stainless-steel pin
3. Quantities:

    a. For doors up to 87 inches high, provide three hinges per leaf.
    b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.

E. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame.

F. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

G. Cylinders and Keying: As specified in Section 087110 "Door Hardware."

H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

I. Operating Trim: BHMA A156.6.

J. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

K. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

L. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

M. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

N. Silencers: BHMA A156.16, Grade 1.

O. Thresholds: Thermally Broken, BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.5 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Fabricate thermally broken aluminum-framed entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

C. Fabricate thermally broken aluminum-framed doors that are reglazable without dismantling perimeter framing.

1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1" long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
2. Accurately fit and secure joints and corners. Make joints hairline in appearance.
3. Prepare components with internal reinforcement for door hardware.
4. Arrange fasteners and attachments to conceal from view.

D. Weather Stripping: Provide weather stripping locked into extruded grooves in door panels or frames as indicated on manufactures drawings and details.

E. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing thermally broken aluminum swing entrance doors, hardware, accessories, and other components.

D. Install thermally broken aluminum swing entrance doors level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

E. Set sill threshold in bed of sealant, as indicated, for weather tight construction.

F. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing thermally broken aluminum swing entrance doors, hardware, accessories, and other components.
3. Install thermally broken aluminum swing entrance doors level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
4. Set sill threshold in bed of sealant, as indicated, for weather tight construction.
5. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on aluminum-framed entrances.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Aluminum-framed entrances will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum-framed door and storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084213

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:

a. Swinging doors.
b. Sliding doors.
c. Gates.

2. Electronic access control system components, including:

a. Electronic access control devices.

3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
4. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 26 sections for connections to electrical power system and for low-voltage wiring.
2. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

   a. Door Index; include door number, heading number, and Architects hardware set number.
   b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
   c. Type, style, function, size, and finish of each hardware item.
   d. Name and manufacturer of each item.
   e. Fastenings and other pertinent information.
   f. Location of each hardware set cross-referenced to indications on Drawings.
   g. Explanation of all abbreviations, symbols, and codes contained in schedule.
   h. Mounting locations for hardware.
   i. Door and frame sizes and materials.
   j. Name and phone number for local manufacturer's representative for each product.
   k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
      1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

   a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
   b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
      1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

   f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

    a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
    b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
    c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Special warranty specified in this Section.

D. Fire Door Assembly Inspection and Testing:

1. Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80-2007 requirements. Written report shall be provided to the Owner to be made available to the Authority Having Jurisdiction (AHJ). Report shall include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

E. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Name, address, and phone number of local representative for each manufacturer.
    d. Parts list for each product.
    e. Final approved hardware schedule, edited to reflect conditions as-installed.
    f. Final keying schedule
    g. Copies of floor plans with keying nomenclature
    h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)

a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.

2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.

4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
2. Maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Attendees: Owner, Contractor, Architect, Installer and Supplier's Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

   a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   b. Preliminary key system schematic diagram.
   c. Requirements for key control system.
   d. Requirements for access control.
   e. Address for delivery of keys.

L. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

   a. Attendees: Door hardware supplier, door hardware installer, Contractor.
   b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

   a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
   b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer's original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
1) Mechanical: 10 years. Electrified: 2 years.

b. Automatic Operators: 1 year.
c. Exit Devices:

1) Mechanical: 3 years.
2) Electrified: 1 year.

d. Locksets:
1) Mechanical: 3 years.
2) Electrified: 1 year.

e. Continuous Hinges: Lifetime warranty

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

A. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

A. Provide five-knuckle, ball bearing hinges.

1. Manufacturers and Products:

a. Scheduled Manufacturer and Product: Ives 5BB series
b. Acceptable Manufacturers and Products: Hager BB series, McKinney TA/T4A series, Stanley FBB Series

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high

b. Interior: Heavy weight, steel, 5 inches (127 mm) high

3. 2 inches or thicker doors:

   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.4 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:

   a. Scheduled Manufacturer: Ives.
   b. Acceptable Manufacturers: Markar, Stanley.

2. Requirements:

   a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.25, Grade 2.
   b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.

c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges with symmetrical hole pattern.

2.5 ELECTRIC POWER TRANSFER

A. Manufacturers:

a. Scheduled Manufacturer: Von Duprin
b. Acceptable Manufacturers: Falcon, ABH

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.6 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.7 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series
2. Acceptable Manufacturers and Products: Corbin-Russwin ML2000 series, Best 45H series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2. Indicators: Where specified, provide indicator window measuring a minimum 2 inch x 1/2 inch with 180 degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
6. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:

    a. Universal input voltage – single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
    b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
    c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
    d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
    e. Request to Exit Switch (RX) –
        1) Modular Design – provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
        2) Monitoring – where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.

    f. Connections – provide quick-connect Molex system standard.
    g. UL Listed – 3 hour fire door

7. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Schlage 17A.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.8 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 99/33 series

2. Acceptable Manufacturers and Products: Detex Advantex series, Precision Apex series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs also acceptable.
4. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
5. Provide exit devices with manufacturer's approved strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
7. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
8. Provide cylinder dogging at non-fire-rated exit devices, unless specified less dogging.
9. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

11. Concealed Vertical Cable Exit Devices: provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating. Vertical rods not permitted.

    a. Cable: Stainless steel with abrasive resistant coating. Conduit and core wire ends snap into latch and center slides without use of tools.
    b. Wood Door Prep: Maximum 1 inch x 1.1875 inch x 3.875 inches top latch pocket and 1 inch x 1.1875 inch x 5 inches bottom latch pocket which does not require the use of a metal wrap or edge for non-rated or fire rated wood doors up to a 45 minute rating.
    c. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.

d. Top Latchbolt: Minimum 0.38 inch (10 mm) and greater than 90 degree engagement with strike to prevent door and frame separation under high static load.
e. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
f. Product Cycle Life: 1,000,000 cycles.
g. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
h. Latch release does not require separate trigger mechanism.
i. Cable and latching system characteristics:
    1) Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
    2) Connected to exit device at single point in steel and aluminum doors, and two points for top and bottom latches in wood doors.
    3) Bottom latch height adjusted, from single point for steel and aluminum doors and two points for wood doors, after system is installed and connected to exit device, while door is hanging
    4) Bottom latch position altered up and down minimum of 2 inches (51 mm) in steel and aluminum doors without additional adjustment. Bottom latch deadlocks in every adjustment position in wood doors.
    5) Top and bottom latches in steel and aluminum doors and top latch in wood doors may be removed while door is hanging.
    6) Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.

12. Provide UL labeled fire exit hardware for fire rated openings.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.

2.9 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 6000 series
2. Acceptable Manufacturers and Products: Folger Adam 300 series, HES 1006 series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide fail-secure type electric strikes, unless specified otherwise.
5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

2.10 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage or Von Duprin PS900 series
2. Acceptable Manufacturers and Products No Substitutions

B. Requirements:

1. Provide power supplies, recommended and approved by manufacturer of electrified locking component, for operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring power supply.
2. Provide appropriate quantity and size of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide appropriate option boards for power supplies necessary for proper operation of the electrified locking components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component used in the system.
4. Provide regulated and filtered 24 VDC power supply and UL class 2 listed.
5. Options:

    a. Provide power supply, where specified, with internal capability of charging sealed backup batteries 24 VDC, in addition to operating DC load.
    b. Provide sealed batteries for battery back-up at each power supply where specified.
    c. Provide keyed power supply cabinet.

6. Provide power supply in an enclosure, complete, and requiring 120VAC to fused input.
7. Provide power supply with emergency release terminals, where specified, that allow release of all devices upon activation of fire alarm system complete with fire alarm input for initiating “no delay” exiting mode.

2.11 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage

B. Requirements:

1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. Security: dual-locking cylinder with **interchangeable** core requiring restricted, patented keyway.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected.
4. Security Cylinders: Where indicated, provide cylinders/cores with "dual-locking mechanism" with interlocking finger pin(s) to check for patented features on keys.
5. Nickel silver bottom pins.
6. Temporary Construction Cylinder Keying.

    a. Owner or Owner's Representative will void operation of temporary construction keys.

7. Replaceable Construction Cores..

    a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
        1) 12 construction change (day) keys.

2.12 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. All Locks to be keyed into the owner existing Master Key System as directed by the owner.

2. Provide keys with the following features.

    a. Material: Solid nickel plated

3. Identification:

    a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
    b. Identification stamping provisions must be approved by the Architect and Owner.
    c. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
    d. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

4. Quantity: Furnish in the following quantities.

    a. Change (Day) Keys: 3 per cylinder/core.
    b. Permanent Control Keys: 3.
    c. Master Keys: 6.
    d. Unused balance of key blanks shall be furnished to Owner with the cut keys.
    e. Extra Keys:
        1) **6** Construction Keys

2.13 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer: Telkee
2. Acceptable Manufacturers: HPC, Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

    a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
    b. Provide hinged-panel type cabinet for wall mounting.

2.14 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. Acceptable Manufacturers and Products: Sargent 281 series, CR DC6000

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.15 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.16 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

    a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, Sargent

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.18 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero International
2. Acceptable Manufacturers: Pemko, Reese

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds::

a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width

b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.20 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.21 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN
2. Acceptable Manufacturers: Rixson, Sargent

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordination projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Wire magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.22 FINSHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).

I. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.

J. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 FIELD INSPECTIONS:

A. Fire Door Assembly Inspection and Testing: Provide functional testing and inspection of fire door assemblies in accordance with NFPA 80-2007/2010. Inspections shall be performed by individuals certified by Intertek as a Fire Door Assembly Inspector, using reporting forms provided by the Door and Hardware Institute (DHI). Alternatively, inspections may be performed by individuals acceptable to the Architect, who have knowledge and understanding of the operating components of the applicable door type, and who have experience in preparing written reports of testing and inspection results.

1. Schedule fire door assembly inspection within 90 days of Substantial Completion of the Project.
2. Submit a signed, written final report as specified in Paragraph 1.4: Submittals.
3. Contractor shall correct all deficiencies and schedule a reinspection of fire door assemblies which were noted as deficient on the inspection report.
4. Inspector shall reinspect fire door assemblies after repairs are made.
5. Additional re-inspections which are required due to incomplete repairs will be performed by the inspector at the expense of the Contractor.

3.6 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.7 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.8 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.9 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

HARDWARE SETS:

VERIFY LOCKSET FUNCTION WITH ARCHITECT AND OWNER BEFORE PROVIDING SUBMITTALS.

HARDWARE GROUP NO. 01

FOR USE ON DOOR #(S):

100B	100C	101B	102A	107D	110C-MR
123B	123E	125B	126B	123F	

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA		All Hardware by Door Supplier		

HARDWARE GROUP NO. 02

FOR USE ON DOOR #(S):
105B-MR 110B-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1			NO HARDWARE REQUIRED (CASED OPENING)		

HARDWARE GROUP NO. 03

FOR USE ON DOOR #(S):
101-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	INTERFACE BOX	JB7 AS REQUIRED		VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA SRI	689	LCN
1	EA	MOUNTING PLATE	MOUNTING PLATES/BRACKETS AS REQUIRED	689	LCN
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	DOOR CONTACT	679-05WD/HM AS REQUIRED	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS Coordinate Power Supply Requirement with Security Provider	LGR	VON
1			PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		
1			SEALS BY DOOR SUPPLIER		

OPERATIONAL: DOOR CLOSED AND LOCKED. VALID CREDENTIAL ALLOWS ACCESS. FREE EGRESS AT ALL TIMES. DPS TO BE USED BY ACCESS CONTROL.

HARDWARE GROUP NO. 04

FOR USE ON DOOR #(S):

103A 106A 110A-MR 118A 123A 125A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 4.5x5.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	INTERFACE BOX	JB7 AS REQUIRED		VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	MOUNTING PLATE	MOUNTING PLATES/BRACKETS AS REQUIRED	689	LCN
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	DOOR CONTACT	679-05WD/HM AS REQUIRED	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS Coordinate Power Supply Requirement with Security Provider	LGR	VON
1			PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		

OPERATIONAL: DOOR CLOSED AND LOCKED. VALID CREDENTIAL ALLOWS ACCESS. FREE EGRESS AT ALL TIMES. DPS TO BE USED BY ACCESS CONTROL.

HARDWARE GROUP NO. 05

FOR USE ON DOOR #(S):
106-MR 107-MR 113A 116A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 17A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCERS	SR64	GRY	IVE

HARDWARE GROUP NO. 06

FOR USE ON DOOR #(S):
103-MR 104-MR 104A 104B 107C 126C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	PERIMETER SEAL	488S	CLR	ZER

HARDWARE GROUP NO. 07

FOR USE ON DOOR #(S):
105A 120A 121A 122A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCERS	SR64	GRY	IVE
1	EA	COAT AND HAT HOOK (WALL MOUNT)	574	626	IVE

HARDWARE GROUP NO. 08

FOR USE ON DOOR #(S):
109-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCERS	SR64	GRY	IVE
2	EA	COAT AND HAT HOOK (WALL MOUNT)	574	626	IVE

HARDWARE GROUP NO. 09

FOR USE ON DOOR #(S):
108-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17A	626	SCH
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCERS	SR64	GRY	IVE

HARDWARE GROUP NO. 10

FOR USE ON DOOR #(S):

100A	100D	101A	102B	103B	106B
107A	107E	123D	125C	126A	105A-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 4.5X5.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD-99-NL-OP-110MD	626	VON
1	EA	MORTISE CYLINDER	20-059 X K510-730 XQ11-948	626	SCH
2	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE GROUP NO. 11

FOR USE ON DOOR #(S):
102A-MR

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	SPRING HINGE	3SP1 4.5 X 4.5 BTM LEAF	652	IVE
2	EA	HINGE	5BB1 4.5 X 4.5 TOP LEAF	652	IVE
1	EA	DUTCH DOOR BOLT	054 TOP LEAF	626	IVE
1	EA	STOREROOM LOCK	L9080T 17A BTM LEAF	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP BTM LEAF	626	SCH
1	EA	WALL STOP/HOLDER	FS495 TOP LEAF	626	IVE
1	EA	WALL STOP	WS406/407CCV BTM LEAF	630	IVE
4	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12

FOR USE ON DOOR #(S):
110A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER

HARDWARE GROUP NO. 13

FOR USE ON DOOR #(S):
114A 115A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 14

FOR USE ON DOOR #(S):
118B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 15

FOR USE ON DOOR #(S):
109A 117A 124A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BBHW 4.5X5.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE GROUP NO. 16

FOR USE ON DOOR #(S):
107B 112A 123C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	PERIMETER SEAL	488S	CLR	ZER

HARDWARE GROUP NO. 17

FOR USE ON DOOR #(S):
101D 119A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BBHW 4.5X5.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	INTERFACE BOX	JB7 AS REQUIRED		VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	MOUNTING PLATE	MOUNTING PLATES/BRACKETS AS REQUIRED	689	LCN
1	EA	DOOR CONTACT	679-05WD/HM AS REQUIRED	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS Coordinate Power Supply Requirement with Security Provider	LGR	VON
1			PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS		
1			PROVIDE RISER DIAGRAMS		

OPERATIONAL: DOOR CLOSED AND LOCKED. VALID CREDENTIAL OR REMOTE SWITCH ALLOWS ACCESS. FREE EGRESS AT ALL TIMES. DPS TO BE USED BY ACCESS CONTROL.

HARDWARE GROUP NO. 18

FOR USE ON DOOR #(S):
126C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA (180 deg)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	PERIMETER SEAL	488S	CLR	ZER

PROVIDE MAGNETIC HOLD OPEN FOR DOOR – NOT REQUIRED UNTIL FULL OCCUPATION

HARDWARE GROUP NO. 19

FOR USE ON DOOR #(S):
109B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BBHW 4.5X5.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 17A	626	SCH
1	EA	PRIMUS XP CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER

End of Section

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Entrances and storefronts.

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

E. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Insulating glass.
2. Glazing sealants.
3. Glazing gaskets.

F. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.

C. Source Limitations for Tinted Glass: Obtain tinted, heat-absorbing, and light-reducing float glass from one primary-glass manufacturer for each tint color indicated.

D. Source Limitations for Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.

E. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

F. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part 3.

2.2 GLASS PRODUCTS

A. Heat Treated Float Glass: All interior glass and exterior glass where required by safety glazing standards:

1. ASTM C 1048: Type 1, Q3, HS or FT where indicated or required by authorities having jurisdiction or specifically by applicable codes.

B. ¾" Insulating Glass Units: All exterior glass:

1. Preassembled units consisting of dual sealed lites of fully tempered glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in the Insulating Glass Schedule.
2. Provide heat treated float glass, Kind HS where recommended by manufacturer to comply with system performance requirements specified and Kind FT where safety glass is designated or required.
3. Performance characteristics designated for coated insulation glass are nominal values abase on manufacturer's published data for units with lites 6 mm thick and nominal ½ inch dehydrated space between lites, unless otherwise noted.
4. Low-E Coating: "Solarban" 60 Solar Control (Sputtered), by PPG Industries, or equal.

2.3 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.

B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to

maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.9 MONOLITHIC FLOAT-GLASS SCHEDULE

A. Uncoated Clear Float Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:

1. Uncoated Clear Fully Tempered Float Glass: Kind FT (fully tempered).

B. Application: Provide at interior doors and windows.

3.10 INSULATING-GLASS SCHEDULE

A. Low-E Insulating Glass: Where glass of this designation is indicated, provide low-emissivity insulating-glass units complying with the following:

1. Overall Unit Thickness and Thickness of Each Lite: 24 mm (1") and 6 mm as indicated.
2. Interspace Content: Argon
3. Indoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.

a. Kind FT (fully tempered), Condition A (uncoated surfaces).

4. Outdoor Lite: Gray tinted vision glass.

a. Condition A Kind FT (fully tempered).

5. Low-Emissivity Coating or Film: Sputtered on second surface, Sputtered on third surface or low-emissivity coated film suspended in the interspace.

6. Provide white laminated glass for windows at drawing locations noted to have "obscured insulated glazing". Interior lite shall have an overall thickness of ¼ inch with laminate interlayer. All other aspects of these windows shall be the same as other insulated glass.

B. Application: Provide at windows and exterior storefronts.

C. Shading coefficient: 0.44 maximum.

D. Visible Light Transmission: 70%.

E. Winter Night-time U-Value: 0.31.

F. Solar Heat Gain Coefficient: 0.38.

G. Outdoor Visible Light Reflectance: 11%

END OF SECTION 08800

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. See structural drawings for more detail.

B. Windborne-Debris-Impact Resistance: Louvers located within 30 feet of grade shall pass enhanced-protection, large-missile testing requirements in ASTM E 1996 for Wind Zone 4 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is See Structural drawings.

2. Component Importance Factor: 1.5 for data center including mechanical yard.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

F. FEMA 361 Standard: Comply with FEMA 361 Design and Construction for Community Shelters (Zone IV criteria), 250 mps wind, 15 pound 2 inch by 4 inch impact at 100 mps.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Carnes Company.
   b. Cesco Products
   c. Greenheck Fan Corporation.
   d. NCA Manufacturing, Inc.
   e. Pottorff.
   f. Ruskin Company.

2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:

   a. Point of Beginning Water Penetration: Not less than 950 fpm.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at louvers indicated.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 8 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
2. Finish: Same finish as louver frames to which louver screens are attached.

3. Type: Non-rewirable, U-shaped frames.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

G. Provide anchors, anchor bolts, anchor bolt spacing, and embedment per manufacturer's recommendations.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 INTERIOR GYPSUM BOARD

A. Available Manufacturers: subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   a. CertainTeed Corporation
   b. Georgia-Pacific Building Products
   c. National Gypsum Company
   d. United States Gypsum Company

NOTE: The use of imported gypsum board is prohibited in this project. Contractors shall provide Material Safety Data Sheet for all gypsum board used and the origin of the gypsum board.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.
3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Impact-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 2.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Core: 5/8 inch, Type X.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Thickness: 5/8 inch, Type X.
2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, or rolled zinc.

C. Aluminum Trim: ASTM B 221, Alloy 6063-T5.

D. Aluminum Control Joint
1. ¾ inch width reveal.
2. Finish: Clear anodized aluminum.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.7 AUXILIARY MATERIALS

A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screw complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).

D. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.

1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

1. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

E. Prefill open joints, rounded or beveled edges, and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile or Panels that are substrate for acoustical tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099000 "Interior Painting."

4. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in Section 099000 "Interior Painting."

H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain Floor Tile
2. Porcelain Wall Tile
3. Stone thresholds
4. Waterproof membrane
5. Tile backing panels
6. Metal edge strips

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.

3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

A. Ceramic Tile Type CT-1: High Tech Porcelain

1. Stone peak High Tech-Area 3D Collection and or equal.
2. Composition: High Tech Porcelain.
3. Face Size: 12 x 12
4. Thickness: 3/8 inches (9.5 mm)
5. Face: Plain with square edges.
6. Glaze: Mat, Honed.
7. Tile Color and Pattern: As selected by Architect from manufacturer’s full range.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base Cove: Cove Base 6 x 12 inches.

B. Ceramic Tile Type CT**-#** Porcelain wall tile.

1. Stone peak High Tech-Area 3D Collection and or equal.
2. Module Size: 12 x 12 mosaics 2 x 2 polished.
3. Face Size Variation: 2 x 2
4. Thickness: 3/8 inches (9.5 mm).
5. Face: Pattern of design indicated, with manufacturer's standard edges.
6. Finish: Polished.
7. Tile Color and Pattern: As selected by architect from manufacturer’s full range.
8. Grout Color: As selected by Architect from manufacturer’s full range.

    a. Wainscot Cap: Bullnose 3 x 12.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

2.4 SETTING MATERIALS

A. Portland Cement Mortar (Thinset) Installation Materials: ANSI A108.02.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bostick, Inc.
   b. MAPEI Corp.
   c. TEC, a subsidiary of H. B. Fuller Co.

2. For wall applications, provide non-sagging mortar.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to , the following:

   a. Bonsal American, an Oldcastle company; Grout Sealer.
   b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
   c. MAPEI Corporation; KER 003, Keraseal Penetrating Sealer for Unglazed Grout and Tile.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Exterior tile floors.
b. Tile floors in wet areas.
c. Tile swimming pool decks.
d. Tile floors in laundries.
e. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
f. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm) 1/8 inch (3.2 mm).
2. Quarry Tile: 1/4 inch (6.4 mm) 3/8 inch (9.5 mm).
3. Pressed Floor Tile: 1/4 inch (6.4 mm) [3/8 inch (9.5 mm).
4. Glazed Wall Tile: 1/16 inch (1.6 mm) 1/8 inch (3.2 mm).
5. Porcelain Tile: [1/4 inch (6.4 mm) [3/8 inch (9.5 mm).

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex Portland cement mortar (thinset).

K. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

L. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

M. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Source Limitations for Ceiling Units and Suspension System: Obtain each product from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
3. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

F. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS

A. Basis of Design Products – Match GSD stocked product:

1. Certain Teed “BET-157”.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted. First "Type and Form" Subparagraph below is an example of a panel with scrubbable finish.
2. Pattern: Fine fissured

C. Color: White.

D. LR: Not less than 0.83

E. NRC: Not less than 0.55.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Square.

H. Thickness: 35/8 inch.

I. Modular Size: 24 by 24 inches.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

D. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch diameter bolts.

2.5 METAL SUSPENSION SYSTEM

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch wide metal caps on flanges.

1. Structural Classification: Intermediate duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel or aluminum cold-rolled sheet as standard with manufacturer.
5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.
3. Resilient molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

A. Basis of Design Product: Subject to compliance with requirements, the Basis of Design product to be incorporated into the Work includes the product listed below:

1. Johnsonite; Dura-Cove Rubber Wall Base or approved equal.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style B, Cove: Provide in areas with resilient flooring and where indicated on the drawings.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length or cut lengths 48 inches long minimum.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors: Colors to be selected by architect by from manufacturers full range of colors

2.2 RUBBER MOLDING ACCESSORY

A. Description: Rubber reducer strip for resilient flooring or joiner for tile and carpet or transition strips.

B. Profile and Dimensions: Architect shall choose from manufacturer's standard profiles and dimensions.

C. Locations: Provide rubber molding accessories in areas as required.

D. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.3 RESILIENT RUBBER STAIR TREAD/ RISERS AND FLOOR TILE

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories: Johnsonite resilient rubber stair tread and risers and Floor Tile and or equal.

1. Color/Location: Colors to be selected by architect from manufacturer’s full range of colors.
2. Type: Rubber.
3. Raised round surface, visually impaired with Grit Tape insert.
4. Raised round rubber floor tile.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Floor Polish: Remove soil, visible adhesive and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply two coat’s or per manufacturers recommendations.

C. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl enhanced floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL ENHANCED FLOOR TILE

A. Available Manufacturers: Subject to compliance with requirements, manufacturers that may be incorporated into the Work include the following:

1. Armstrong World Industries
2. Johnsonite, A Tarkett Company
3. Mannington Mills, Inc.

B. Basis of Design Product:

1. Johnsonite; Azrock VET Color Essence

C. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

D. Wearing Surface: Smooth.

E. Thickness: 1/8"" (3.2 mm).

F. Size: 12 by 12 inches.

G. Colors and Patterns: Colors to be selected by architect from manufacturers full range of colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:

a. Vinyl Enhance Tile Adhesives: 50 g/L or less.
b. Rubber Floor Adhesives: 60 g/L or less.

2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls

within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis or in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat’s or per manufacturers recommendation.

C. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes resinous flooring systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERORMANCE REQUIREMENTS

A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flammability: Self-extinguishing according to ASTM D 635.

2.2 RESINOUS FLOORING

A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. Basis of Design Product: Subject to compliance with requirements, provide the following or an architect approved equal.

1. Sherwin Williams, General Polymers; Ceramic Carpet 400

C. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Non-skid orange-peel texture as selected by Architect from manufacturer's full range of textures, Sherwin Williams 5190 Non Skid, or equal.
3. Overall System Thickness: 1/8 inch.

D. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

1. Sherwin Williams, General Polymers; 3579 Standard Primer/Binder

E. First and Second Broadcast Coats: Flexible resin formulation that is recommended by resinous flooring manufacturer.

1. Sherwin Williams, General Polymers; 3561 Resin Glaze and 5900F ESTES Colored Quartz Aggregate, both materials both coats.
2. Resin: Epoxy.
3. Type: Clear.
4. Application Method: Self-leveling slurry, use squeegee or nap roller to spread then broadcast aggregates.
5. Number of Coats: Two.
6. Thickness of Coats: Per manufacturer’s requirements.
7. Aggregates: Manufacturer's standard Colored quartz (ceramic-coated silica) aggregates.

F. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

G. Grout Coat:

1. Sherwin Williams, General Polymers; Grout Coat and 3745 Self-Leveling Epoxy

H. Topcoats: Sealing or finish coats.

1. Sherwin Williams, General Polymers;

2. Resin: Epoxy.
3. Type: Clear.
4. Number of Coats: As necessary for finish selected.
5. Thickness of Coats: Per manufacturer’s requirements.
6. Finish: Gloss.

I. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 12,000psi minimum according to ASTM C 579.
2. Tensile Strength: 2,500psi minimum according to ASTM C 307.
3. Flexural Modulus of Elasticity: 4,500psi minimum according to ASTM C 580.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks or entire substrate surface per manufacturer’s recommendations.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions. Round internal and external corners.

1. Integral Cove Base: 4 inches high.

E. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.

1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.

G. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.

H. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

I. Protect resinous flooring from damage and wear during the remainder of construction period.

END OF SECTION 096723

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Carpet tile type, color, and dye lot.
2. Type of subfloor.
3. Type of installation.
4. Pattern of installation.
5. Pattern type, location, and direction.
6. Pile direction.
7. Type, color, and location of insets and borders.
8. Type, color, and location of edge, transition, and other accessory strips.
9. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

D. Samples for Initial Selection: For each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

E. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

F. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 IINFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 10 percent of amount installed for each type indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Shaw Contract Group; a Berkshire Hathaway company; “Momentum IV” or a comparable product by one of the following or equal:

1. J&J Invision; J&J Industries, Inc.
2. Mohawk Group (The); Mohawk Carpet, LLC.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Quarter Turn (Field), Running Bond

D. Fiber Content: 100 percent nylon 6, 6.

E. Pile Characteristic: Pattern-loop pile.

F. Pile Thickness: .119 inches for finished carpet tile according to ASTM D 6859.

G. Gage: 1/12 per inch.

H. Total Weight: 30 oz./sq. yd. (g/sq. m) for finished carpet tile.

I. Primary Backing/Backcoating: MFR's Synthetic

J. Secondary Backing: Ecoworx tile or equal

K. Size: 24 by 24 inches.

L. Applied Treatments:

1. Soil-Resistance Treatment: ssp shaw soil protection or equal
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

    a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

M. Performance Characteristics:

1. Appearance Retention Rating: Moderate traffic, 2.5 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.75 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
4. Delamination: Not less than 4 lbf/in. according to ASTM D 3936.
5. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
6. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
7. Electrostatic Propensity: Less than-2.8 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns specified.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099000 – INTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior high-performance paint and coatings systems including surface preparation.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 051200 – Structural Steel.

C. Section 055210 – Pipe and Tube Railings.

D. Section 081114 – Steel Doors and Frames.

E. Section 092900 - Gypsum Board.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):

1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 2 - Hand Tool Cleaning.
3. SSPC-SP 3 - Power Tool Cleaning.
4. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

1.4 SUBMITTALS

A. Submit under provisions of Section 013000 - Administrative Requirements.

B. Product Data: For each paint system indicated, including.

1. Product characteristics.
2. Surface preparation instructions and recommendations.
3. Primer requirements and finish specification.
4. Storage and handling requirements and recommendations.
5. Application methods.
6. Cautions for storage, handling and installation.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, compatibility, adhesion, and application workmanship.

1. Finish surfaces for verification of products, colors and sheens.
2. Finish area designated by Architect.
3. Provide samples that designate primer and finish coats.
4. Test for adhesion in accordance with ASTM D-3559 after 1 week of curing. Document results to architect prior to full installation.
5. Do not proceed with remaining work until the Architect approves the mock-up.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.

1. Product name, and type (description).
2. Application and use instructions.
3. Surface preparation.
4. VOC content.
5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sherwin-Williams, which is located at: 101 Prospect Ave.; Cleveland, OH 44115; Toll Free Tel: 800-524-5979; Tel: 216-566-2000; Fax: 440-826-1989;

B. Requests for substitutions will be considered in accordance with provisions of Section 016000 - Product Requirements.

2.2 APPLICATIONS/SCOPE

A. Interior High Performance Paints and Coatings:

1. Concrete: Poured, precast, cement board.
2. Concrete Floors: 4” line striping
3. Non-Ferrous Metal: Galvanized steel and aluminum.
4. Metal Ferrous: Decking, structural steel, joists, trusses, beams, and similar items.
5. Metal Ferrous: Doors, Jambs, and miscellaneous items.
6. Drywall: Drywall board, Gypsum board
7. PVC Plastics: miscellaneous.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings.

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

2.4 HIGH PERFORMANCE INTERIOR PAINT SYSTEMS

A. CONCRETE – (Concrete Bollards)

1. Epoxy Systems (Solvent Base):

a. Semi-Gloss Finish:

1) 1st Coat: S-W Loxon Concrete & Masonry Primer, A24W8300
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
3) 3rd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0 mils wet, 5.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

B. PRECAST CONCRETE PANELS: (Walls – Normal Exposure).

1. Epoxy Systems (Solvent Base Finish):

a. Semi-Gloss Finish:

1) 1st Coat: S-W Loxon Concrete & Masonry Primer, A24W8300
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
3) 3rd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0 mils wet, 5.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

C. PRECAST CONCRETE PANELS: (Walls – Wash Bays immersion service).

1. Epoxy Systems (Solvent Base Finish):

a. Semi-Gloss Finish:

1) 1st Coat: S-W Kem Cati-Coat Epoxy Filler, B42W400
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
3) 3rd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0 mils wet, 5.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

D. CONCRETE BOARD - (Walls – Normal Exposure)

1. Epoxy Systems (Solvent Base):

a. Semi-Gloss Finish:

1) 1st Coat: S-W S-W Loxon Concrete & Masonry Primer, A24W8300
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
3) 3rd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0 mils wet, 5.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

E. NON-FERROUS- (Galvanized and Aluminum Conduit):

1. Epoxy Systems (Solvent Base):

a. Semi-Gloss Finish:

1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0 mils wet, 5.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

F. FERROUS METAL - (Decking, Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous).

1. Epoxy System:

a. Semi-Gloss Finish:

1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0 mils wet, 5.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

G. METAL - (Ferrous Metal Doors, Jambs, etc).

1. Waterbased Alkyd Urethane Coating:

a. Semi-Gloss Finish:

1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
2) 1st Coat: S-W Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series.

3) 2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series. (5.0 mils wet, 1.7 mils dry per coat).

H. DRYWALL - (Walls, Ceilings, Gypsum Board).

1. Epoxy Systems (Water Base):

a. Eg-Shel Finish:

1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-150 Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-150 Series (4 mils wet, 1.5 mils dry per coat).

I. PVC & PLASTICS - (Miscellaneous).

1. Acrylic Systems (Water Base):

a. Eg-Shel Finish:

1) 1st Coat: S-W Extreme Bond Primer, B51W150 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-560 Series.
3) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-560 Series. (5.0 mils wet, 2.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

J. CONCRETE FLOOR STRIPING – (4” Line Striping)

1. Waterborne Acrylic-Alkyd System:

a. Flat Finish:

1) 1st Coat: S-W Pro-Park Waterborne Traffic Marking Paint, B97 Series.
2) 2nd Coat: S-W Pro-Park Waterborne Traffic Marking Paint, B97 Series. (15.0 mils wet, 9.0 mils dry per coat).

*Field applied mock-up required in accordance with 1.5D

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. PreCast Panel Walls (Wash Bays), Concrete: SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical/abrasive methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, form release agents, curing membranes, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

D. Precast Panel Walls (Normal Exposure)/Cement Board: Remove all surface contamination by pressure cleaning with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, curing membranes, form release agents, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. Apply a test area, allow the coating to dry at least one week before testing in accordance with ASTM D3359. If adhesion is poor, mechanical abrasion/abrasive blasting may be necessary to remove these treatments.

E. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped

and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

F. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

G. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 099000

SECTION 099600 – EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior high-performance paint and coatings systems including surface preparation.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 051200 – Structural Steel.

C. Section 055210 – Pipe and Tube Railings.

D. Section 081114 - Steel Doors and Frames.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):

1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 3 - Power Tool Cleaning.
3. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: For each paint system indicated, including.

1. Product characteristics.
2. Surface preparation instructions and recommendations.
3. Primer requirements and finish specification.
4. Storage and handling requirements and recommendations.
5. Application methods.
6. Cautions for storage, handling and installation.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, compatibility, adhesion, and application workmanship.

1. Finish surfaces for verification of products, colors and sheens.
2. Finish area designated by Architect.
3. Provide samples that designate primer and finish coats.
4. Test for adhesion in accordance with ASTM D-3559 after 1 week of curing. Document results to architect prior to full installation.
5. Do not proceed with remaining work until the Architect approves the mock-up.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.

1. Product name, and type (description).
2. Application and use instructions.
3. Surface preparation.
4. VOC content.
5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sherwin-Williams, which is located at: 101 Prospect Ave.; Cleveland, OH 44115; Toll Free Tel: 800-524-5979; Tel: 216-566-2000; Fax: 440-826-1989;

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 APPLICATIONS/SCOPE

A. Exterior High Performance Paints and Coatings:

1. Concrete: Bollards.
2. Non-Ferrous Metal: Galvanized steel and aluminum.
3. Metal Ferrous: Structural steel, joists, trusses, beams, and similar items.
4. Metal Ferrous: Doors, Jambs, and miscellaneous items.
5. PVC Plastics: miscellaneous.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings.

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

2.4 HIGH PERFORMANCE EXTERIOR PAINT SYSTEMS

A. CONCRETE – (Concrete Bollards)

1. Epoxy/Urethane Systems (Solvent Base):

a. Gloss Finish:

1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
2) 2nd Coat: S-W Hi Solids Polyurethane Gloss, B65-300 Series
3) 3rrd Coat: S-W Hi Solids Polyurethane Gloss, B65-300 Series (4.5 mils wet, 3.0 mils dry per coat).

B. NON-FERROUS- (Galvanized Steel):

1. Epoxy/Urethane Systems (Solvent Base):

a. Semi-Gloss Finish:

1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
2) 2nd Coat: S-W Hi Solids Polyurethane Semi-Gloss, B65-300 Series
3) 3rd Coat: S-W Hi Solids Polyurethane Semi-Gloss, B65-300 Series (4.5 mils wet, 3.0 mils dry per coat).

C. FERROUS METAL - (Exterior Decking, Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous).

1. Epoxy/Urethane System:

a. Semi-Gloss Finish:

1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
2) 2nd Coat: S-W Hi Solids Polyurethane Semi-Gloss, B65-300 Series
3) 3rd Coat: S-W Hi Solids Polyurethane Semi-Gloss, B65-300 Series (4.5 mils wet, 3.0 mils dry per coat).

D. METAL - (Ferrous Metal Doors, Jambs, etc).

1. Waterbased Alkyd Urethane Coating:

a. Semi-Gloss Finish:

1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
2) 1st Coat: S-W Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series.
3) 2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Semi-Gloss, B53-1150 Series. (5.0 mils wet, 1.7 mils dry per coat).

E. PVC & PLASTICS - (Miscellaneous).

1. Acrylic Systems (Water Base):

a. Eg-Shel Finish:

1) 1st Coat: S-W Extreme Bond Primer, B51W150 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-560 Series.
3) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-560 Series. (5.0 mils wet, 2.0 mils dry per coat).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in

each space or area, reinstall items removed using workers skilled in the trades involved.

3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, form release agents, curing membranes, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

D. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

E. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mil scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings

prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 099600

SECTION 101416 - PLAQUES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plaques.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plaques.

1. Include fabrication and installation details and attachments to other work.
2. Show plaque mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each plaque at least half size.

C. Samples: For each exposed product and for each color and texture specified.

D. Plaque Schedule: Use same designations specified or indicated on Drawings or in a plaque or sign schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 PLAQUES

A. Cast Plaque: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers:

a. Gemini Incorporated
b. Metal Arts; Division of L&H Manufacturing Co.
c. Bronze Memorials.net
d. Matthew International Corporation; Bronze Division

2. Plaque Material: Cast aluminum.
3. Plaque Thickness: 0.25 inch (6.35 mm) minimum.
4. Finishes:

a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
b. Overcoat: Manufacturer's standard baked-on clear coating.

5. Background Texture: Leatherette or as indicated on the Drawings.
6. Integrally Cast Border Style: Single line raised matte finish border or as indicated on the Drawings.
7. Mounting: Concealed studs.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque, unless otherwise indicated.

2.4 FABRICATION

A. General: Provide manufacturer's standard plaques according to requirements indicated.

1. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
2. Conceal connections only.
3. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners only.
4. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place plaque in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

C. Remove temporary protective coverings and strippable films as plaques are installed.

END OF SECTION 101416

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cutout dimensional characters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least quarter size.

C. Samples: For each exposed product and for each color and texture specified.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior dimensional letter signage, allow for thermal movements from ambient and surface temperature changes.

2.2 DIMENSIONAL CHARACTERS

A. Cutout Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Gemini Incorporated Dimensional Characters or comparable product by one of the following:

a. A.R.K. Ramos
b. ACE Sign Systems, Inc
c. Gemini Incorporated
d. Metal Arts
e. Metallic Arts
f. Southwell Company

2. Character Material: Sheet or plate aluminum.
3. Character Height: 12 inches and 8 inches.
4. Thickness: 1/2 inch nominal.
5. Finishes:

a. Integral Aluminum Finish: Anodized finish as selected by architect from manufacturer’s full range of colors including clear.
b. Overcoat: Manufacturer's standard baked-on clear coating.

6. Mounting: Concealed studs, non-corroding for substrates encountered.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

4. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace signs for stability and for securing fasteners.
5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Room-identification signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille and layout for each sign at least half size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 SIGNS

A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Best Sign Systems; Lucent, 1/4" Matte with subsurface painted.
2. Thermoformed Acrylic Sign: Manufacturer’s standard monolithic tactile plaque constructed utilizing a thermoforming process, which provides a fully homogeneous plaque sign. The sign body, face, raised text and Braille are compression molded to form a single dimensional component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti.

    a. Composite-Sheet Thickness: 0.25 inch.
    b. Surface Graphics: Integral to sign, paint.
    c. Subsurface Graphics: Paint.
    d. Contrast: Letters, numbers and symbols shall contrast with background.
    e. Tactile Characters/Symbols Raised 1/32 inch from sign plate face.
    f. Braille: Grade 2 Braille, placed directly below last line of letters or numbers.
    g. Color(s): As selected by Architect from manufacturer's full range.

3. Sign-Panel Perimeter: Finish edges smooth.

    a. Edge Condition: Bullnosed.
    b. Corner Condition in Elevation: Standard radius corner.

4. Mounting: Manufacturer's standard adhesive or two-face tape for substrates indicated.

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, Type UVF (UV filtering).

2.4 ACCESSORIES

A. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.5 FABRICATION

A. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

B. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Methods:

1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101423

SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARMENTS

A. Manufacturers:

1. American Sanitary Partition Corporation.
2. Bobrick Washroom Equipment, Inc.

3. Bradley Corporation; Mills Partitions.
4. General Partitions Mfg. Corp.
5. Partition Systems Incorporated of South Carolina.

B. Toilet-Enclosure Style: Overhead braced and floor anchored.

C. Urinal-Screen Style: Wall hung and Floor anchored.

D. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges and no-sightline system. Provide minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels.

E. Pilaster Shoes: Formed from stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

F. Urinal-Screen Post: Manufacturer's standard post design of monolithic phenolic urinal screen cut out at bottom to form a post; with shoe matching that on the pilaster.

G. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, stainless steel.

H. Phenolic-Panel Finish:

1. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard through-color core matching face sheet.
2. Edge Color: Manufacturer's standard.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty stainless steel operating hardware and accessories.

1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes at posts to conceal anchorage.

E. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

   a. Pilasters and Panels: 1/2 inch (13 mm).
   b. Panels and Walls: 1 inch (25 mm).

2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.

   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

   a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION 102113.17

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Division 6 Section “Rough Carpentry” for wood blocking in walls.

1.2 SUMMARY

A. This Section includes the following:

1. Toilet and bath accessories.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.
2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:

1. Toilet and Bath Accessories:

a. Bobrick Washroom Equipment, Inc.
b. Bradley Corporation.
c. A&J Washroom Accessories, Inc.

2. See Drawings for Schedule of Accessories used as “Basis of Design.”

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

G. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

D. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying.

1. Provide minimum of 4 keys to Owner’s representative.

2.4 UNDERLAVATORY GUARDS

A. Under Lavatory Guard
1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Samples for Initial Selection: For each type of exposed finish required.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.

F. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Specialties, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.
c. Larsens Manufacturing Company.

B. Cabinet Construction: Rated as required for fire-resistance rating of walls where they are installed.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch thick cold-rolled steel sheet lined with minimum 5/8-inch thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Aluminum sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semi-recessed Cabinet (EC-1): One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

E. Surface-Mounted Cabinet (EC-2): Cabinet box fully exposed and mounted directly on wall with no trim.

F. Cabinet Trim Material: Aluminum sheet, same material and finish as door.

G. Door Material: Aluminum sheet.

H. Door Style: Center glass panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide recessed door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Red.
4) Orientation: Vertical.

L. Materials:

1. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 (ASTM B 221M) for extruded shapes.

a. Finish: Clear anodic.

2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.

3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ansul Incorporated; Tyco International.
b. Guardian Fire Equipment, Incorporated
c. JL Industries, Inc.; a division of the Activar Construction Products Group.
d. Kidde Commercial Division
e. Larsens Manufacturing Company.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type (FE) in Steel Container: UL-rated 4-A: 60-B: C, 10-lb (4.6-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

C. Wet-Chemical Type K (FE-1) in a Stainless Steel Container: UL-rated K, 1.6gal. or 2.5gal. nominal capacity as required, with potassium acetate based chemical in a stainless steel container; with pressure-indicating gage.

D. Clean-Agent Type (FE-2) in Aluminum Container: UL-rated 2-B: C, 2.5-lb (1.1-kg) nominal capacity, with HCFC Blend B agent and inert material in enameled-aluminum container; with pressure-indicating gage.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105500 - PRIVATE-DELIVERY POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Horizontal mail receptacles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.

B. Shop Drawings: For postal specialties.

1. Include plans, elevations, sections, and attachment details.
2. Include identification sequence for compartments.

C. Samples for Verification: For each type of exposed finish, prepared on 6-by-6-inch-Samples.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Key Blanks: **100** for each type of compartment-door lock installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Furnish lock keys with temporary identification for their respective locks, bagged, and securely taped inside the collection compartment for shipping.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HORIZONTAL MAIL RECEPTACLES

A. Rear-Loading, Horizontal Mail Receptacles: Consisting of multiple compartments enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from rear of unit with accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door.

1. Rear-Loading Cover: Not required.

2. Compartments with Aluminum Doors: Manufacturer's standard compartments with doors fabricated from extruded aluminum. Equip each with lock, tenant identification, and concealed, full-length, flush hinge on one side.

a. Compartments: As indicated on Drawings.
b. Tenant Identification: Identification engraved into face of compartment door.

3. Compartment-Door Locks: Five-pin tumbler, cylinder locks capable of at least 1000 key changes; with three keys for each compartment door. Key each compartment differently.
4. Frames: Ganged and nested units, with cardholder and blank cards for tenant's identification behind each compartment.
5. Snap-on Trim: Fabricated from the same material and finish as compartment doors.
6. Concealed Components and Mounting Frames: Aluminum or steel sheet with manufacturer's standard finish.
7. Exposed Aluminum Finish: Finish surfaces exposed to view as follows:

a. Anodic Finish: Clear.

2.2 ACCESSORIES

A. Key Cabinet: Wall-mounted, steel cabinet with pivoting, key-holding panels and side-hinged door equipped with five-pin tumbler, cylinder door lock and concealed, full-length flush hinge. Finish cabinet, panels, and door with baked-enamel or powder-coated finish. Provide key control system consisting of key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers.

1. Capacity: Keys for 100 mail-receptacle locks.
2. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.

B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.

C. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.

D. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.

E. Weld in concealed locations to greatest extent possible without distorting or discoloring exposed surfaces. Remove weld spatter and welding oxides from exposed surfaces.

F. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support loads.

G. Fabricate rack ladders to support indicated number of units to form a column of units.

H. Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturers of dissimilar metals.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for roughing-in openings, clearances, and other conditions affecting performance of the Work.

B. Examine walls and other adjacent construction for suitable conditions where units will be installed.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install postal specialties level and plumb, according to manufacturer's written instructions and roughing-in drawings.

1. Where dissimilar metals are in permanent contact with each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation as recommended by manufacturer for this purpose.

2. Where aluminum contacts grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust doors, hardware, and moving parts to function smoothly, and lubricate as recommended by manufacturer. Verify that integral locking devices operate properly.

C. Touch up marred finishes or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal-specialty manufacturer.

D. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

E. On completion of postal-specialty installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 105500

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. High Pile Rack Storage.

1.2 COORDINATION

A. Coordinate locations and installation of high pile rack storage that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For high pile rack storage.

1. Include plans, elevations, sections, and attachment details.
2. Include installation details and sizes of anchor bolts, connectors, lateral bracing, and special bracing.
3. Load plaque drawings.

C. Samples: For each type of metal storage shelving and for each color specified.

D. Delegated-Design Submittal: For high pile rack storage.
1. Submit all calculations for rack design required by ANSI MH16.1-2012, including loading of rack members, vertical impact loads, seismic loading, and overturning.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data and requirements.

B. Load application and rack configuration drawings.

C. R-Mark Certification.

1.6 QUALITY ASSURANCE

A. R-Mark Certification required for design of the Rack System by Delegated Design Engineer.

B. Manufacturer of Rack System must be a Rack Manufacturer's Institute member company.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, licensed in the state of WV, using performance requirements and design criteria indicated, including ANSI MH16.1 – 2012.

B. Horizontal Force Loading: As noted on structural drawings.

2.2 HIGH PILE RACK STORAGE SYSTEM

A. High Pile Rack Storage System: For storage of standard (42"x48" pallets) and pallets of other sizes, complying with ANSI MH16.1 – 2012 Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks. All portions of rack system shall be part of a single manufacturer's system, integrated and designed for the intended purpose. Rack shelves are supported by beams that span between supporting truss frames, that allow beam-height adjustment over the full height of the rack unit. Provide adjustable beams and accessories necessary for complete installation.

B. Shelf Rack Load-Carrying Capacity: 2,500 per pallet space, minimum.

1. 6'-0" Shelf Length: 5,000 lb minimum per shelf.
2. 8'-0" Shelf Length: 5,000 lb minimum per shelf.
3. 12'-0" Shelf Length: 7,500 lb minimum per shelf.
4. Rack System shall be self-supporting. Bracing to walls and structure is not allowed. Bracing to adjacent racks is permissible.

C. Upright Frames: Steel truss style.

1. Depth: 42"
2. Height: 20'-0"
3. Load Capacity: 32,200 lb minimum.
4. Adjustable at increments of 2"
5. Integral safety clips.
6. Finish: Powder Coat, manufacturer's standard high gloss, color selected by Architect.

D. Beams: Steel with teardrop connections for adjustable upright frames.

1. Size per loading requirements.
2. Provide beam locking devices.

E. Shelfs:

1. Welded wire rack decking.
2. Loading capacity: 2,500 lbs.

F. Accessories:

1. Row Spacers: 12” galvanized steel.
2. Heavy Duty Post Protectors: 24” galvanized steel, painted.
3. Anchor Bolts: Galvanized steel, size and type determined by Delegated Design Engineer.
4. Bracing: Size and type determined by Delegated Design Engineer.
5. Pallet Supports: Size and type determined by Delegated Design Engineer.
6. End of Aisle Protection: Galvanized steel.
7. Column/upright Base Plates
8. Shims: Galvanized steel.
9. Other accessories as required for full installation of the High Pile Rack Storage System.
10. Loading Plaques: Plastic, noting design loads of rack supported platforms

2.3 ANCHORS

A. Floor Anchors: Galvanized steel, size and type determined by Delegated Design Engineer. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install high pile rack storage system level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping. Install per Manufacturer’s written instructions, in accordance with Delegated Design Engineer’s recommendations, and in accordance with ANSI MH16.1-2012.

1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
3. Anchor units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.

3.2 ARRANGEMENT

A. See Drawings for arrangement of types, locations, and placement of racks.

3.3 ERECTION TOLERANCES

A. Per Manufacturer’s equipment tolerances.

3.4 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Adjust operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105600

SECTION 111313 - LOADING DOCK BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes loading dock bumpers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of loading dock bumper.

B. Shop Drawings: For dock bumpers. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 LOADING DOCK BUMPERS

A. General: Surface-mounted bumpers; of type, size, and construction indicated; designed to absorb kinetic energy and minimize damage to loading dock structure.

1. Basis-of-Design Product: Kelley Steel Faced Dock Bumper or and approved equal.

B. Laminated-Tread Loading Dock Bumper: Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires.

1. Thickness: 8 inch laminated –tread bumper plus ½" steel face plate.
2. Horizontal Style: 9 inches high by 10 inches wide.
3. Coordinate exact size with other dock equipment and dock ramp slope.

C. Materials: ASTM A36/A36M for steel plates, shapes, and bars. Hot-dip galvanize according to ASTM A123/A123M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Attach loading dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.

1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.

2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.
3. Screw Attachment: Attach dock bumpers to wood construction with lag bolts as indicated.

B. After completing installation of exposed, factory-finished dock bumpers, inspect exposed finishes and repair damaged finishes.

END OF SECTION 111313

SECTION 111316 - LOADING DOCK SEALS AND SHELTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Frame-type loading dock shelters.
2. Transparent-strip door curtains.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

C. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 FRAME-TYPE LOADING DOCK SHELTERS

A. General: Dock shelters designed to form a seal with sides and top of truck body while leaving entire width and height of truck's rear opening unobstructed.

1. Basis-of-Design product: Kelley TS 1000 Rigid Frame Dock Shelter or an approved equal.

B. Rigid-Frame Type: Fabricated from fiberglass side and top panels attached to fixed supporting framework. Provide head and side curtains with built-in flexible stays, wind straps between head curtain and side frame, pleated protectors, reinforcing, and guide strips. Slope head frame from center for drainage. Provide replaceable, fabric-covered, tapered, foam-bottom pads and protective steel bumpers of size and type required for application shown.

C. Construction: Fabricate to sizes and shapes indicated or required to fit door-opening sizes shown, and allow for not less than 18 inches of truck-body penetration when truck is docked.

1. Wood Framework: Factory painted; mechanically fastened together using nails and lag bolts or metal connectors to form a rigid assembly.
2. Steel Framework: Zinc-plated steel tubing of size and thickness standard with manufacturer, with joints welded.

a. Steel Finish: Hot-dip galvanize components to comply with the following:

1) ASTM A123/A123M for iron and steel support framing.
2) ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.

3. Top and Side Panels: White, translucent fiberglass, 0.045 inch thick, weighing 6 oz. /sq. ft...
4. Tapered Side Panels: Taper side panels to angle required to accommodate sloped loading dock approach grades, and make sealing edge of dock shelter parallel to back edge of truck. Taper for declined approach.
5. Guide Strips: 4-inch wide, coated, nylon guide strips on side curtains.
6. Pleated Protectors: On head curtain of overlapping layers of coated fabric attached to base fabric.
7. Reinforcing: Manufacturer's standard reinforcing over cover fabric on side curtains and top cover of dock shelter.

D. Accessories:

1. Buffer flaps.
2. Bottom filler curtain.
3. Bottom seal pads.

2.2 TRANSPARENT-STRIP DOOR CURTAINS

A. General: Door curtains consisting of overlapping strips suspended from top of opening to form a sealed door curtain.

B. Strip Material: Curved, clear, ribbed, transparent, extruded PVC. Fabricate strips for manufacturer's standard method of attachment to overhead mounting system indicated.

1. Standard Grade: Designed to withstand temperature range of 0 to plus 150 dig F.

2. Mail Room Curtain:

a. Width: 6 inches.
b. Overlap: 2 inches.
c. Thickness: 0.080 inch thick.

3. Warehouse Curtain:

a. Width: 12 inches.
b. Overlap: 2 inches.
c. Thickness: 0.120 inch thick.

C. Header Mounting: Angle bolted or welded to opening lintel; equip angle with permanently attached mounting pins and a steel-angle or -plate retaining strip attached to angle with wing nuts.

D. Wall Offset Mounting: Angle bolted to face of wall projecting out on each side of door opening to allow hanging strips to clear overhead door hood. Equip angle with permanently attached mounting pins and a steel angle or plate retaining strip attached to angle with wing nuts. Return hanging strips to face of wall at jambs to fully enclose space interior to overhead door.

E. Steel Finish: Hot-dip galvanize components to comply with the following:

1. ASTM A123/A123M for iron and steel support mounting.
2. ASTM A153/A153M or ASTM F2329 for iron and steel hardware and anchors.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Coordinate electrical connections with Division 26 Sections.

3.2 INSTALLATION OF FOAM PAD LOADING DOCK SEALS

A. Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.

3.3 INSTALLATION OF LOADING DOCK SHELTERS

A. Attach dock shelters securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure an effective seal of dock-shelter curtains with sides and top of truck body when trucks are positioned against dock bumpers.

3.4 INSTALLATION OF FRAME-TYPE LOADING DOCK SHELTERS

A. Attach dock shelters securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure an effective seal of dock-shelter curtains with sides and top of truck body when trucks are positioned against dock bumpers.

3.5 INSTALLATION OF TRANSPARENT-STRIP DOOR CURTAINS

A. Transparent-Strip Door Curtains: Attach door-curtain mounting system to lintel with screw anchors or toggle bolts. Mount curtain strips to overlap.

3.6 ADJUSTING

A. After completing installation, inspect exposed factory finishes and repair damaged finishes.

END OF SECTION 111316

SECTION 111319 - STATIONARY LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Edge-of-dock loading dock levelers.
2. Truck restraints.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For stationary loading dock equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product test reports.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace dock levelers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Structural Assembly: 1 year from date of Substantial Completion.
2. Warranty Period for Hydraulic System: 1 year from date of Substantial Completion.
3. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 EDGE-OF-DOCK LOADING DOCK LEVELERS

A. General: Surface-mounted, hinged-lip-type, edge-of-dock levelers designed for permanent installation on face of loading dock platform.

1. Basis-of-Design: Kelley Mechanical Series, Edge-of-Dock Leveler, KM 7230.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Standard: Comply with MH 30.1.

D. Rated Capacity: Capable of supporting total gross load of 30,000 lb. without permanent deflection or distortion.

E. Platform Ramp Width: 72 inches.

F. Hinged Lip: Not less than ½ inch thick, nonskid steel tread plate.

1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube and grease fittings, with gussets on lip and ramp for support.

G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:

a. Above Adjoining Platform: 5 inches.
b. Below Adjoining Platform: 5 inches.

2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 3 inches over width of ramp.
4. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.

    a. Length of Lip Extension: Not less than 12 inches from face of dock bumpers and not less than 17 inches measured from ramp edge.

5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs. Leveler shall be capable of retracting to stored position while truck is at loading dock.

H. Mechanical Operating System: Manual control; counterbalance and spring operation. Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with a torsion-spring counterbalancing mechanism controlled by a hold-down device.

1. Lever Handle: Self-storing lever handle for raising unloaded ramp with minimal lifting force by pulling lever back to extend lip and pushing lever forward to lower ramp and lip.
2. Removable Lifting Handle: For raising unloaded ramp by lifting action.

I. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- and formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

J. Integral Laminated-Tread Dock Bumper: See Section 111313 Loading Dock Bumpers

K. Dock-Leveler Finish: Manufacturer's standard prime-paint or baked-on factory finish.

L. Accessories:

1. Self-forming pan.
2. Cast-in-place design.
3. Run-off guards.
4. Ramp approach plate.
5. Interlock to truck restraint.

2.2 TRUCK RESTRAINTS

A. General: Manufacturer's standard device designed to engage truck's rear-impact guard and hold truck at loading dock.

1. Basis-of-Design: Kelley Star 4 Vehicle Restraint.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Standard: Comply with MH 30.3.

D. Rated Capacity: Capable of supporting total gross load of 32,000 lb. without permanent deflection or distortion.

E. Operating Range: Capable of restraining rear-impact guards within a range from:

1. Vertical Range: Minimum of 11 1/2 inches to maximum of 28 inches above driveway.
2. Horizontal Range: Zero to 10 inches in front of dock bumpers.

F. Power Operating System: Manufacturer's standard electromechanical or hydraulic unit.

1. Remote-Control Station: Single-button station of the constant-pressure type, enclosed in NEMA ICS 6, box. Restraint is engaged by depressing and holding button; restraint is released by releasing button.
2. Interlock: Leveler does not operate while truck restraint is not engaged.

G. Rear-Impact-Guard Sensor: Detects presence of rear-impact guard.

H. Caution Signs: Exterior, surface mounted; designed to inform both dock attendant and truck driver; with sign copy as follows. Provide one sign at each truck-restraint location.

1. Sign Copy in Forward and Reverse Text: Manufacturer's standard text permitting truck movement with green light.
2. Interior Sign Copy: Manufacturer's standard text permitting truck movement with green light.

I. Light Communication System: Red and green illuminated signal-light sets, with lens approximately 4 inches in diameter, designed to indicate status to both dock attendant and truck driver. Equip system with steel control panel located at interior of dock that includes illuminated lights indicating status of exterior signal lights. Provide signal-light set and control panel at each location indicated for light communication system. Enclose exterior signal-light sets in steel or plastic housing with sunshade.

1. Manual Operation: System is activated by push button or switch located on interior control panel.
2. Mounting: Wall.

J. Alarm: Audible and visual system indicating that rear-impact guard is not engaged, with manual reset.

K. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55.
3. Steel Tubing: ASTM A500/A500M, cold formed.
4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

L. Truck-Restraint Finish: Manufacturer's standard electrodeposited zinc coating.

M. Accessories: Interlock to dock leveler.

2.3 FINISH REQUIREMENTS

A. Finish loading dock equipment after assembly and testing.

B. Hot-Dip Galvanizing: Comply with the following:

1. ASTM A123/A123M for iron and steel loading dock equipment.
2. ASTM A153/A153M or ASTM F2329/F2329M for iron and steel hardware for loading dock equipment.

C. Spray Zinc Metallizing: ASTM B833.

D. Electrodeposited Zinc Coatings: ASTM B633.

E. Steel Prime Paint Finish: Clean, pretreat, and apply manufacturer's standard primer.

F. Baked-on Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

1. Color: Manufacturer's standard.
2. Toe Guards: Paint to comply with ANSI Z535.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install loading dock equipment as required for a complete installation.

1. Rough-in electrical connections.

3.2 INSTALLATION OF EDGE-OF-DOCK LOADING DOCK LEVELERS

A. Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.

1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.

3.3 INSTALLATION OF TRUCK RESTRAINTS

A. Attach truck restraints in a manner that complies with requirements for arrangement and height required for device to engage vehicle rear-impact guard**.** Interconnect control panel and signals with dock leveler.

1. Wall-Mounted Units: Weld and Anchor.

a. Weld truck restraints to steel mounting plate embedded in loading dock edge.
b. Anchor truck restraints to face of loading dock with expansion anchors and bolts.

2. Driveway-Mounted Units: Anchor truck restraints to driveway with expansion anchors and bolts.
3. Pit-Mounted Units: Anchor truck restraints to concrete pit with expansion anchors and bolts.

3.4 ADJUSTING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. Test dock levelers for vertical travel and adjust to maintain operating range indicated.

C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 111319

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-FACED CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic-laminate-faced cabinets of stock design.

B. Related Requirements:

1. Section 123623 "Plastic-Laminate-Clad Countertops."

1.2 DEFINITIONS

A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

B. MDF: Medium-density fiberboard.

C. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work, locations of hardware, field joints and filler panels.

C. Samples: For cabinet finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification or WI Certified Compliance Program certificates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.

C. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWI's "Architectural Woodwork Quality Standards."

1. Provide AWI Quality Certification Program labels indicating that manufactured wood casework complies with requirements.

D. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for Custom grade.

1. Provide WI-certified compliance certificate indicating that manufactured wood casework complies with requirements of grades specified.
2. Product Designations: Drawings indicate manufactured wood casework configurations by referencing WI design series numbering system as defined in WI's "Manual of Millwork."

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.
d. Deterioration of finishes

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements of this specification, provide casework constructed by a manufacturer located in the state of West Virginia or an approved equal complying with AWI and WI standards.

B. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

2.2 CASEWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom.
2. Provide labels from AWI or WI certification program indicating that casework complies with requirements of grades specified.

B. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured plastic-laminate-faced cabinets.

2.3 CASEWORK

A. Design:

1. Flush overlay.

B. Exposed Materials:

1. Plastic Laminate: Grade HGS and Grade VGS.

a. Colors and Patterns: As selected by Architect from manufacturer's full range.

2. Unless otherwise indicated, provide specified edge banding on all exposed edges.
3. Rigid PVC Extrusions: Through color with Satin finish, 3mm thick at doors and drawer fronts, 1mm thick elsewhere.

C. Semi-exposed Materials:

1. Plastic Laminate: Grade CLS unless otherwise indicated. Provide plastic laminate for semi-exposed surfaces unless otherwise indicated.
2. Thermoset Decorative Panels: Provide thermoset decorative panels for semi-exposed surfaces unless otherwise indicated.

a. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.

2.4 MATERIALS

A. Low-Emitting Materials: Fabricate casework, including countertops, with adhesives and composite wood products containing no urea formaldehyde.

B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated; made without urea formaldehyde.

C. Softwood Plywood: DOC PS 1.

D. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.

E. MDF: ANSI A208.2, Grade 130; made with binder containing no urea formaldehyde.

F. Hardboard: ANSI A135.4, Class 1 Tempered.

G. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Formica Corporation
b. Lab Designs Laminate
c. Wilsonart International

H. Edge banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

I. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

J. Edge banding for Thermoset Decorative Panels: PVC or polyester edge banding matching thermoset decorative panels.

2.5 COLORS AND FINISHES

A. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected by Architect from thermoset decorative panel manufacturer's full range of solid colors.

B. Plastic-Laminate Colors, Patterns, and Finishes: As selected by Architect from plastic-laminate manufacturer's full range.

C. PVC Edge banding Color: As selected from casework manufacturer’s full range.

2.6 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, Type B01602, 100 degrees of opening, self-closing. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high.

C. Pulls: Solid chrome-plated brass wire pulls, fastened from back with two screws. For sliding doors, provide recessed chrome-plated flush pulls. Provide two pulls for drawers more than 24 inches wide.

D. Door Catches: Zinc-plated, dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches high.

E. Drawer Slides: BHMA A156.9, Type B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated, steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100, for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
3. File Drawer Slides: Grade 1HD-200, for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
4. Pencil Drawer Slides: Grade 1, for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.
5. Keyboard Slides: Grade 1, for computer keyboard shelves.
6. Trash Bin Slides: Grade 1HD-200, for trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide.

F. Drawer and Hinged Door Locks: Cylindrical (cam) type, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks on all doors and drawers.

PART 3 - EXECUTION

3.1 CASEWORK INSTALLATION

A. Install casework level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Base Cabinets: Set cabinet's straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.

C. Wall Cabinets: Hang cabinet's straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

D. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

E. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.2 CLEANING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123216

SECTION 123623 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic-laminate countertops.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Plastic laminates, for each color, pattern, and surface finish.

1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates or WI Certified Compliance Program certificates.

1.4 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Certified participant in AWI's Quality Certification Program or Licensee of WI's Certified Compliance Program.

B. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.

C. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWI's "Architectural Woodwork Quality Standards."

1. Provide AWI Quality Certification Program labels indicating that manufactured wood casework complies with requirements.

D. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for Custom grade.

1. Provide WI-certified compliance certificate indicating that manufactured wood casework complies with requirements of grades specified.
2. Product Designations: Drawings indicate manufactured wood casework configurations by referencing WI design series numbering system as defined in WI's "Manual of Millwork."

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

1. Provide labels from AWI or WI certification program indicating that countertops, including installation, comply with requirements of grades specified.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Formica Corporation
b. Lab Designs Laminate
c. Wilsonart International

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from manufacturer's full range of colors patterns and finishes.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material at Sinks: Medium-density fiberboard made with exterior glue.

G. Core Thickness: 1-1/8 inch.

H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

I. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
2. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.4 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch, if used as edge band.
2. Radius exposed outside corners of plastic laminate counter tops.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

B. Field Jointing: Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

C. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

END OF SECTION 123623.13

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel framing.
2. Metal roof panels.
3. Metal wall panels.
4. Metal soffit panels.
5. Thermal insulation.
6. Windows.
7. Accessories.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and attachments to other work.

C. Samples: For units with factory-applied finishes.

D. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.

6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
11. Include MBMA/IAS AC472 Quality Certification.

C. Material test reports.

D. Source quality-control reports.

E. Field quality-control reports.

F. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer who is a member of MBMA.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.7 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period for Metal Wall Panels: 30 years from date of Substantial Completion.

2. Finish Warranty Period for Metal Roof Panels: 25 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Varco Pruden Buildings or an approved equal meeting the requirements of this specification.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.
2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
3. Deflection and Drift Limits: No greater than the following:

    a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
    b. Girts: Horizontal deflection of 1/240 of the span.
    c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
    d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
    e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
    f. Lateral Drift: Maximum of 1/400 of the building height.

C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental

effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

E. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E119 or ASTM E108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.

F. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

G. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.

H. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

I. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

J. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 or ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

K. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

L. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 60.

M. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are

listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-60.
2. Hail Resistance: MH.

N. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C1363 or ASTM C518:

1. Roof:

   a. U-Factor: As Noted on Drawings.
   b. R-Value: As Noted on Drawings.

2. Walls:

   a. U-Factor: As Noted on Drawings.
   b. R-Value: As Noted on Drawings.

2.3 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters and rake beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

   a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Frame Configuration: Single gable, One-directional, sloped and Multiple gable.
3. Exterior Column: Tapered.
4. Rafter: Tapered.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate

framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, pre-painted with coil coating, to comply with the following:

G. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

2.4 METAL ROOF PANELS

A. Standing-Seam, Trapezoidal-Rib, Metal Roof Panels: Formed with interlocking ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.

1. Basis-of-Design: Varco Pruden “SSR” Standing Seam Roof

2. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch nominal uncoated steel thickness. Pre-painted by the coil-coating process to comply with ASTM A755/A755M.

   a. Exterior Finish: Three-coat fluoropolymer.
   b. Color: As selected by Architect from manufacturer's full range.

3. Clips: One-piece fixed to accommodate thermal movement.
4. Joint Type: Mechanically seamed.
5. Panel Coverage: 24 inches.
6. Panel Height: 3 inches.

2.5 METAL WALL PANELS

A. Concealed-Fastener, Flush-Profile, Metal Wall Panels: Formed with vertical panel edges and **flush surface**; with flush joint between panels; with 1-inch wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.

1. Basis-of-Design: Varco Pruden, Impressaclad Wall Panel.

2. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.036-inch nominal uncoated steel thickness. Pre-painted by the coil-coating process to comply with ASTM A755/A755M.

   a. Exterior Finish: Fluoropolymer.
   b. Color: As selected by Architect from manufacturer's full range.

3. Panel Coverage: 16 inches.
4. Panel Depth: 7/8 inch.

2.6 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels: Basis-of-Design: Varco Pruden, FP-12 Soffit.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.036-inch nominal uncoated steel thickness. Pre-painted by the coil-coating process to comply with ASTM A755/A755M.

a. Exterior Finish: Fluoropolymer, Smooth finish, Beaded Profile with 2 stiffening beads.
b. Color: As selected by Architect from manufacturer's full range.

2. Panel Coverage: 12 inches.
3. Panel Depth: 7/8 inch.

2.7 THERMAL INSULATION

A. Faced Metal Building Insulation: ASTM C991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

B. Unfaced Metal Building Insulation: ASTM C991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

C. Retainer Strips: For securing insulation between supports, 0.025-inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.

D. Vapor-Retarder Facing: ASTM C1136, with permeance not greater than 0.02 perm when tested according to ASTM E96/E96M, Desiccant Method.

2.8 WINDOWS

A. Aluminum Windows: Metal building system manufacturer's standard thermally broken, with self-flashing mounting fins, and as follows:

1. Type, Performance Class, and Performance Grade: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:

a. Fixed Units: FW-CW30.

2. Efficiency Requirements:

a. Assembly Max U-Value: U-0.35.
b. SHGC: 0.40 Max.

B. Glazing: Comply with requirements specified in Section 088000 "Glazing."

C. Finish:

1. Baked-Enamel Finish, Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 0.7 mil, medium gloss.

a. Color: As selected by Architect from manufacturer's full range.

2.9 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, pre-painted with coil coating; finished to match adjacent metal panels.

E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, pre-painted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, pre-painted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Roof Curbs: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch nominal uncoated steel thickness pre-painted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.

H. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.10 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.11 SOURCE QUALITY CONTROL

A. Special Inspection: See Section 014533 Special Inspections.

PART 3 - EXECUTION

3.1 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.

    a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, ventilators, and other penetrations of roof and walls.

H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
5. Joist Installation: Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
6. Joist Installation: Weld joist seats to supporting steel framework.
7. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.2 METAL PANEL INSTALLATION, GENERAL

A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

    a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling or self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
6. Provide metal closures at peaks, rake edges, rake walls and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

3.5 METAL SOFFIT PANEL INSTALLATION

A. Provide metal soffit panels the full width of soffits. Install panel’s perpendicular to support framing.

B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.6 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.

4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Blanket Roof Insulation: Comply with the following installation method:

1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
2. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
3. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.

    a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

    a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

5. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.7 WINDOW INSTALLATION

A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.

1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.

B. Set sill members in bed of sealant or with gaskets, for weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Mount screens directly to frames with tapped screw clips.

3.8 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Tie downspouts to underground drainage system indicated.

E. Circular Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Mount ventilators on

flat level base. Install preformed filler strips at base to seal ventilator to metal roof panels.

F. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.

G. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

H. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

I. Roof Mounted Walkway System: 20 gage (0.040 inch) G90/Z275 galvanized planks, supports and hardware for attachment to top of standing seam roof with no fastener penetrations through roof.

1. Nominal 24 inch x 24 inch panels providing a continuous run, parallel with standing seams.
2. Nominal 24 inch x 24 inch panels providing a continuous run, perpendicular to the standing seams.
3. Load rating: 500 lbs/sf.
4. Low Profile System

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 133419

SECTION 211000 – WATER BASED FIRE SUPPRESSION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the complete installation of a full wet-pipe, fire protection sprinkler system and related items.

B. Provide all items, articles, materials, operations and/or methods listed, mentioned or herein specified, including all labor, materials, equipment and incidentals necessary and required for their completion.

C. Design drawings for this project show the location of fire protection system work is required. Any additional system components or sprinkler heads that may be required to meet all NFPA 13 requirements is the responsibility of the contractor. Any areas not shown to be sprinkled but required to be sprinkled by NFPA 13 requirements shall be sprinkled by the contractor and include any and all equipment required.

D. Contractor shall submit design drawings and calculations to engineer for approval prior to submission to WV Fire Marshall.

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provision for Plumbing Work

C. Section 220517 - Sleeving, Cutting, Patching and Repairing – Plumbing

D. Section 220529 – Hangers and Supports For Plumbing Piping and Equipment

1.3 WORK INCLUDED

A. The work covered by this section of the specifications consists of the furnishing of all materials, labor, equipment and appurtenances and the performance of all operations required for the installation of a system of automatic sprinklers.

B. Work shall commence at a point where shown and shall include all necessary parts, accessories and items of work required for a complete and finished installation including all normally closed flow switches for use by the fire alarm system.

C. All piping including all valves, sprinkler heads, alarm valve, control valves, etc.

D. Any apparatus, machinery, material small items or incidentals not mentioned herein, which may be found necessary to complete or perfect any portion of the installation in a substantial manner and in compliance with the requirements stated, implied or

intended in these specifications, shall be furnished without extra cost to the owner. This shall include fire department connections, post indicator valve, water motor gong, ALARM BELL, backflow checks, all electrical power and control wiring and interlock which is not shown on the Electrical Drawings, etc. to provide a complete system and approved fire protection system.

E. The building areas in general are based on light hazard occupancy with storage rooms and mechanical rooms on ordinary hazard; head spacing as required. A system based on hydraulic calculation, as approved by NFPA 13, is acceptable, and as required by the insuring company. Occupancy hazard shall be confirmed by the local Fire Marshal and/or the authority having jurisdiction before calculations are performed.

1.4 SPECIAL REQUIREMENTS

A. No Contractor other than those regularly engaged in the installation of approved and franchised automatic sprinkler systems will be considered or approved for the work under this Section of the specifications. Bidders must have had not less than five years' experience in the fabrication and erection of such systems and shall have completed installations similar and equal in scope to this system under approval by one or more of the recognized underwriting associations in the insurance field.

B. Before submitting bid, examine all mechanical, electrical, architectural, and structural drawings, visit the site and become acquainted with all conditions that may, in any way whatsoever, affect the execution of this work.

C. The Contractor shall take his own measurements and be responsible for exact size and location of all openings required for installation of this work. Figured dimensions where indicated are reasonably accurate and should govern in setting out work. Detailed method of installation is not indicated. Sprinkler Contractor shall coordinate exact ceiling grid location and install sprinkler heads centered in the 2' x 2' and 2' x 4' ceiling panels. Location of sprinkler head must be carefully coordinated with the Architect.

D. It shall be this Contractor's responsibility to verify all existing water line sizes and to conduct water flow tests and report to the Architect and Engineer the results of water flow test. Existing water flow test listed within the bidding documents is for bidding purposes only. The Contractor shall conduct/obtain his own water flow test information for use in shop drawing/hydraulic calculations. Water flow test shall be done in accordance with NFPA 291 and use a minimum of two (2) fire hydrants. The test shall be fully coordinated with the utility company, fire department, and owner and witnessed by the Architect/Engineer's representative.

E. It is not the intent of these Plans and Specifications to provide a complete detailed description of the apparatus, materials, equipment, etc., which is required to make a complete installation of a specified fire protection system. Include all required sprinkler heads, tamper switches, material and equipment and perform all work required to install a complete and approved installation.

F. All materials and methods shall be in accordance with applicable codes, regulations and/or ordinances and meet approval of local inspection authority and insuring agency having jurisdiction. The latest edition of the National Board of Fire Underwriters Bulletins shall be the minimum requirement for all work. All materials under this Contract shall be listed by the Underwriter's Laboratories, Inc., as

approved for fire protection installation. The installation shall comply with the NFPA, and the West Virginia Building Code and Local Fire Marshal in every respect.

G. Perform work under this section in close harmony with other sections so completed work shall present a neat and workmanlike installation.

H. All road crossings or excavation and backfill required for the completion of this work shall be a part of this Contract.

I. Any paving, floors, or other improvements disturbed or destroyed as a result of installation of sprinkler system, shall be restored or replace to Owner's satisfaction.

1.5 SHOP DRAWINGS

A. Prepare detailed shop drawings for the complete sprinkler system, showing the location of the heads, piping, and other installation details and submit plans to the Architect. Drawings shall bear the stamp of a certified sprinkler technician and shall be complete with all calculations and equipment drawings for approval of Architect, Engineer, and the Department of Housing, Building and Construction and/or the authority having jurisdiction.

B. Sprinklers shall be shown on drawings, submittals, and project information and shall be identified by the manufacturer’s style or series designation as published in the appropriate agency listing or approval. Trade names and abbreviations are not permitted.

C. Shop drawings and descriptive literature shall be submitted as a minimum, but not limited to the following:

1. Sprinkler Heads
2. O. S. & Y Valve
3. Alarm Control
4. Back Flow Preventer Detector Check
5. Pipe Hanger and Support
6. Post Indicator Valve
7. Fire Department Connection
8. Fire Hydrants
9. Fire Pit/Vault

1.6 PERMITS, CODES AND INSTALLATIONS

A. All construction permits and inspections for the automatic sprinkler system shall be paid for and furnished under this section. The work shall be installed in a manner to comply with all state and local codes applicable and with all requirements of NFPA Standard 13 latest revision for the installation of sprinkler systems. The entire installation, all materials, etc., shall meet their requirements.

B. Contact the serving Water Company to determine their cost for any tap on fees, vault, values, piping, equipment required to complete the fire protection tie in. These costs shall be included in this Contract.

C. Pay for all fees and costs arising from this installation and for any and all destruction to property, both public and private, which may arise from this service tap on.

D. No work is to be started by the Contractor until Contractor's drawings are approved by the Division of Housing, Building and Construction and the local Fire Marshal's offices, and one copy delivered to the Architect. Entire installation is to be approved by the Division of Housing, Building and Construction, and the local Fire Marshal and/or the authority having jurisdiction. Final payment will not be made until these approvals are received.

1.7 INSURANCE CARRIER REQUIREMENTS

A. All material shall conform to FME & R requirements.

B. Underground piping shall have 3.5 ft. of cover minimum.

C. The sprinkler system shall be hydraulically designed for light hazard requirements except where noted on the drawings. Minimum hose stream shall be 100 gpm applied at the hydrant closest to the user. Design shall use the area/density method. The room design method shall not be used.

D. Shop drawing shall be submitted to the engineer for review prior to other submittals.

E. Shop drawings shall be submitted to HBC for approval prior to the start of construction.

1.8 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Deliver to the architect three (3) copies of the complete operating and maintenance instructions for the equipment furnished and installed under this contract. Provide the aforementioned parties with parts lists for all new equipment items. Each set shall be provided in a plastic or hard back binder with notations of contents. See Section 220100 General Provisions for Plumbing Work.

B. The Contractor shall adequately instruct the Owner's maintenance personnel in the proper operation of all sprinkler devices installed. See Section 220600 Plumbing Systems Demonstration and Training for a complete description of requirements.

1.9 RECORD DRAWINGS

A. After all work has been completed, provide for the Architect's records one (1) complete set of as built "Record Drawings" showing final installation of the work.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. All equipment and materials shall be new and approved by the UL and/or NFPA. System design shall be 175 PSIG.

B. Trade name and manufacturers mentioned herein are intended only to indicate design, quality and size. Other manufacturers products equal in all respects may be substituted, provided they meet with the prior approval of the architect and are found by him to be equal in every way to the items specified herein.

C. All devices shall be in accordance with the rules and regulations of the state fire marshal's office in all cases and shall bear the label of approval of the Underwriters Laboratories and/or NFPA.

2.2 ACCEPTABLE MANUFACTURERS

A. Allied Piping, Firematic, Grinnell, Reliable, Star, Victualic, Viking, Potter Electric Signal, System Sensor.

2.3 INTERIOR WET SYSTEM FIRE PROTECTION PIPING AND FITTINGS

A. Schedule 40, Black Steel Pipe: ASTM A135. Pipe ends may be factory or field formed to match joining method. NPS 1 to NPS 2.

B. Interior piping shall be Allied, or equal, "Lightwall", ASTM-A135, Schedule 10 black steel, assembled with ductile iron grooved bolted, mechanical pipe fittings, ASTM A 536, Series 100 Victaulic, or equal. Joints shall be Victaulic style 75 or equal. NPS 2-1/2 to NPS 8.

1. Grooved joint fittings shall be manufactured of ductile iron, conforming to ASTM A 536; forged steel, conforming to ASTM A 234; or fabricated from carbon steel pipe, conforming to ASTM A 53; with grooved ends conforming to ANSI/AWWA C606.
2. Bulged short pattern fittings may be used in lieu of standard pattern fittings. The fittings shall have a flow rate equal to standard pattern fittings.

C. Grooved joint couplings shall consist of ductile iron housings, conforming to ASTM A 536, complete with pressure responsive synthetic rubber gasket. (Grade to suit the intended service.)

1. Rigid Type: Coupling housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA 13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue and recess rigid type couplings shall not be permitted.

    a. Victaulic Style 005 or engineer approved equal.
    b. 1-1/4" through 4": Installation-Ready, for direct slab installation without field disassembly or loose parts. Victaulic Style 009-EZ or engineer approved equal.

2. Flexible Type: Use in locations where vibration attenuation and stress relief are required or for seismic applications in accordance with manufacturer’s recommendations. Victaulic Style 75 or engineer approved equal.
3. Flange Adapter: Flat face, for direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 744, 741 or equal.

2.4 EXTERIOR FIRE PROTECTION WATER PIPING AND FITTINGS

A. Materials specified and used are subject to final approval of the fire marshal and the local water company.

B. Fire service fittings 2-1/2" and larger shall be cement lined, mechanical joint or grooved end, cast iron water main or PVC pressure in conformance to the latest ASA, ASTM, FS and AWWA specification. Cast iron fittings shall have the manufacturer's standard coal tar on asphaltic base coating outside and a cement lining on the inside, all in accordance with ASA 21.4. Fittings shall be rated at 250 PSI working pressure. PVC piping shall be C-900, 200 PSI rating per local water company standards with tracer wire.

C. All material shall be FME & R approved.

2.5 SPRINKLER HEADS

A. All sprinkler heads shall be Underwriter's approved automatic spray semi-recessed sprinklers and/or exposed upright sprinklers of the correct temperature and type for each location unless otherwise noted. Provide a spare head cabinet with one sprinkler wrench. Quantity of extra heads as indicated in NFPA #13.

B. Stainless steel flexible sprinkler drops may be used to properly locate sprinkler heads. The flexible tube shall be braided (FM-1637) of unbraided/corrugated (UL 2443) type 304 stainless steel. The drops shall be UL listed or FM approved with one-piece open gate bracket for sprinkler installation before or after the bracket is secured to the ceiling gird. Any flexible drop 36-inches or longer must be listed for a minimum of three 90-degree bends to insure proper installation.

C. Sprinkler heads 7' 0" or less above floor and other heads where subject to mechanical injury shall be provided with wire guards.

2.6 SPRINKLER HEAD CABINET

A. Steel Cabinet with hinged cover designed for wall mounting and having a finished appearance. Cabinet shall hold a minimum of six spare sprinklers plus a sprinkler wrench. Provide number of sprinkler heads required by NFPA 13.

2.7 CONTROL VALVES

A. All valves 2" and smaller shall be bronze, solid bronze solid ball or wedge disc, screwed or grooved end pattern, ball type or outside rising stem and yoke, designed for 150 psi working pressure and approved by Underwriters Laboratories and Factory Mutual.

B. All gate valves 2-1/2" and larger shall be iron body, bronze mounted, double disc, parallel seats outside screw and yoke and grooved end, screwed or flanged pattern designed for 160 psi working pressure and approved by Underwriters Laboratories.

C. All butterfly valves 2-1/2" and larger shall be ductile iron body, elastomer encapsulated ductile iron disc with integrally cast stem, grooved pattern designed for 300 psi maximum working pressure and approved by Underwriters Laboratories.

D. Valve Operators: Where indicated on drawings, provide UL and FM approved indicator parts.

2.8 CHECK VALVES

A. Check valves shall be ductile iron body, bronze or stainless steel mounted, flanged or grooved and Underwriters and Factory Mutual approved for 250 psi or 175 lbs. working pressure.

2.9 ALARM VALVES

A. Standard: UL 193. Design: For horizontal or vertical installation. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

2.10 DRAINS

A. Where drains, flushing connections, etc., are necessary to comply with local code or NBFU requirements, they shall be considered a part of this Contract and furnished and installed accordingly, whether shown specifically on the Drawings or covered in these Specifications.

B. All sprinkler branch piping shall be installed to drain at main riser wherever possible.

C. Where sprinkler piping is trapped, an approved auxiliary draw-off shall be provided and installed. Provide all test drains as required. All exposed piping on the exterior of the building shall be rust proofed and painted, color as selected by Architect. Provide splash blocks at all exterior drains.

2.11 INSPECTOR'S TEST STATIONS

A. Install 1" inspection test connection. Discharge from test connection shall run to open air. All locations must comply with NFPA requirements and local Fire Marshall requirements.

B. Inspection test connection shall have an attached metal tag bearing the words "Test Connection".

2.12 PRESSURE GAGES

A. Standard: UL 393. Dial Size: 3-1/2- to 4-1/2-inch diameter. Pressure Gage Range: [0- to 250-psig minimum. Label: Include "WATER" label on dial face.

2.13 ALARMS

A. Provide the following alarms where required or indicated:

1. Water-Motor Operated Alarms
2. Electronically Operated Alarm
3. Water-Flow Indicator
4. Pressure Switch
5. Valve Supervisory Switch
6. Indicator Post Supervisory Switch

2.14 WALL AND CEILING ESCUTCHEONS

A. This contractor shall furnish and install on all lines passing through the floor, ceiling or wall in finished areas, an approved escutcheon as specified in Section 220517 – Sleeving, Cutting, Patching and Repairing - Plumbing. Escutcheons shall be submitted for approval before installation. Standard plates used in the industry may not be acceptable.

2.15 HANGERS

A. Furnish and install all hangers of approved pattern and size to support all pipes in a substantial manner.

B. See Section 220529 – Hangers and Supports for Plumbing Piping and Equipment of these specifications for pipe hangers and brackets.

C. Hangers for overhead piping shall comply with NBFU requirements as to size and spacing. Special and improvised supports and hangers shall meet with the approval of the Underwriters Laboratories and the Architect.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
3. It shall be the responsibility of the contractor to examine the building and the drawings, confirming all dimensions before any pipe is cut, to determine if any offsets, etc., are necessary. Where additional offsets are required, they shall be made without any additional cost to the architect.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

J. Install alarm devices in piping systems.

K. Fill wet-pipe sprinkler system with water.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

N. Be responsible for locating all openings required in walls, floors, ceilings, or roof, for all materials and equipment furnished under this section of the specifications.

O. Sleeves or openings shall be provided for passage of pipes. Where openings or sleeves have been omitted, they shall be drilled or sawed as required by the architect. All cutting and patching shall be done by the trades whose work is affected. All expenses incurred shall be a responsibility of this section of the specifications.

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 Sleeving, Cutting, Patching and Repairing – Plumbing.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 Sleeving, Cutting, Patching and Repairing – Plumbing.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220517 Sleeving, Cutting, Patching and Repairing – Plumbing.

3.2 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

K. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

L. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.

3.4 SPRINKLER INSTALLATION

A. All heads must "line up" and work in with the ceiling pattern of the lights and heating equipment. All heads located in lay-in ceiling tile shall be centered along the centerline of the tile. Heads may be located at the center and quarter points of the tile. Avoid ducts, lights, hangers, etc. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.5 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13. Piping shall be marked on 20' centers. Where pipe extends through walls, identify pipe on both sides of wall.

B. Identify system components, wiring, cabling, and terminals.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.

6. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.8 EXTERIOR FIRE PROTECTION WATER PIPING

A. Installation is subject to final approval of the Fire Marshall and local water company.

B. Mains shall be buried with a minimum of 3.5 ft. of coverage per FM. Mains shall be flushed with water at a minimum of 6 ft. per second, and hydrostatically tested at 200 psi for 2 hours. The contractor shall provide a material and test certificate to the engineer to verify proper testing.

C. Provide all concrete work required for thrust blocks, etc. See drawings for thrust block requirements.

D. Provide all excavation and backfill required.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Fire Suppression System	X	X	X	X		X	X	

END OF SECTION 211000

SECTION 220100 – GENERAL PROVISIONS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the general arrangement of the plumbing systems and related items to complete the work as shown on the drawings and as specified herein.

B. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

C. The Contractor shall familiarize himself with the work of all other trades, general type construction and the relationship of his work to other sections. He shall examine all working drawings, specifications, and conditions affecting his work. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field and advise the Engineer of any discrepancy before performing any work.

D. The work shall include complete testing of all equipment and piping at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment.

E. The Contractor shall perform all necessary temporary work during construction.

F. Work under this section shall conform to all governing codes, ordinances, and regulations of the City, County, and State.

G. The Contractor shall be responsible for all errors in fabrication, for the correct fitting, installation, and erection of the various plumbing systems as shown on the drawings.

1.2 SCOPE

A. This branch of the work includes coordination with all utility companies; providing utility meters; utility tap on fees; agency review fees and all inspection fees; all labor, materials, tools, excavation and backfill and all equipment necessary for the installation of Plumbing Systems as shown on the Drawings and Specifications and/or as required for complete and operating systems. The work shall include the necessary and required tests to insure the proper operation of the complete system.

B. A complete and operating plumbing system shall be provided. See plans for diagrams and details.

C. All work for this project must comply and be in strict accordance with the West Virginia State Building Code, International Plumbing Code, NFPA, ADA, NEC and all local codes and regulations.

D. In general (as a minimum) all materials and equipment must be installed in strict accordance with manufacturer's requirements; and provided with all required controls, internal fusing, relays, piping connections, electrical connections, etc., to provide for complete and operable systems.

1.3 PERMITS, FEES, CODES AND APPROVALS

A. Permits and Fees

1. All permits, tap on fees and agency review and inspection fees necessary for the complete Fire Protection and Plumbing systems shall be obtained by the Contractor from the authorities governing such work. The cost of all permits shall be borne by the Contractor.

B. Codes

1. The minimum standard for all plumbing work shall be the requirements of the West Virginia State Building Code, International Plumbing Code, International Building Code, ADA, The Division of Water Quality and local ordinances. All plumbing and fire protection for this project must as a minimum comply and be in strict accordance with the West Virginia State Building Code, International Plumbing Code, International Fuel Gas Code, NFPA, ADA, NEC, The Division of Water Quality and the "Standards of Safety" of West Virginia.

C. Approvals

1. All work must be approved by the Architect/Engineer, Owner and all related Code Agencies before final payment will be made.
2. As a minimum, the following approval Certificates of Inspection and Approval shall be required:

a. Plumbing Inspection
b. Health Department Inspection
c. Electrical Inspection
d. Local and State Building Inspections.

3. Final payment will be contingent upon all Approval Certificates.

1.4 DRAWINGS AND SPECIFICATIONS

A. Contract drawings for work under this section are in part diagrammatic, intended to convey the scope of work and indicate the general arrangement of equipment, piping and the approximate size and location of equipment and outlets. The Contractor shall follow these drawings in laying out his work and shall verify spaces in which his work will be installed, indicating to the Engineer where any conflicts or overlapping of systems occur. Any item of work not clearly included, specified and/or shown, errors or conflict between Plans (Plumbing, Mechanical, Architectural, Structural or Electrical), Specifications, codes and field conditions, shall be clarified by a written request to the Architect by the Bidder before bidding; otherwise, the bidder shall, at his own expense, supply the proper labor and materials to include these items of work and to make good any damages or defects in his work caused by such error, omission

or conflict. Under no circumstances shall a Contractor scale the Drawings for the location of equipment and work.

B. Where job conditions require reasonable changes in indicated locations and arrangement, proposed departures shall be submitted with detailed drawings to the Engineer for approval before any of the proposed work is commenced. All approved departures shall be made at no additional cost to the Owner.

C. The drawings and the specifications are intended to indicate complete and working systems, unless specifically indicated to the contrary. The work includes the furnishing, installing and connecting of a complete working installation in each case to the full extent set forth in the drawings and herein specified. The Contractor shall be responsible for the complete functioning system, unless specifically noted otherwise.

D. The drawings and specifications shall be considered as cooperative, work and material included in either, though not mentioned in both, shall be a part of the work to be accomplished and shall be carried out completely in as thorough manner as if covered by both.

E. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, pipe, traps, valves and accessories as may be required to make a functional installation at no additional cost to the Owner.

F. Plumbing as built "Record Drawings" shall be kept up to date each day. "Record Drawings" shall be reviewed by Architect/Engineer each month with contractor's pay request review.

G. Any deviation in work as shown on plans and specifications must be approved in writing by Architect/Engineer prior to installation.

1.5 EXAMINATION OF SITE

A. Bidders shall visit the site before submitting proposals to satisfy themselves as to the nature and scope of the work and any difficulties attending to the execution.

B. The submission of a proposal will be construed as evidence that such an examination has been made. Later claims for labor, equipment, materials, etc., required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

1.6 EQUIPMENT DESIGN AND INSTALLATION

A. The design, manufacture, testing, and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the applicable standard rules of the following. Where materials are not specifically referred to, but are required, they shall meet the requirements of the applicable code.
1. NEMA National Electrical Manufacturer's Assoc.
2. UL Underwriter's Laboratories, Inc.
3. ASME American Society of Mechanical Engineers

4.	ASTM	American Society of Testing Materials
5.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
6.	BOCA	Building Officials & Code Administrators International, Inc.
7.	NFPA	National Fire Protection Association
8.	AWWA	American Water Works Association
9.	AWS	American Welding Society
10.	AMCA	Air Moving and Conditioning Assoc.
11.	ANSI	American National Standards Institute
12.	NEC	National Electrical Code
13.	AIEE	American Institute of Electrical Eng.
14.	ARI	Air Conditioning & Refrigeration Institute
15.	SMACNA	Sheet Metal and Air Conditioning Contractors National Assoc.
16.	LSDHBC	Local and/or State Division of Housing, Building and Construction
17.	SPC	State Plumbing Code
18.	NPC	National Plumbing Code
19.	OSHA	Occupational Safety and Health Adm.
20.	EPA	Environmental Protection Agency
21.	DOE	U.S. Department of Energy
22.	IMC	International Mechanical Code
23.	IECC	International Energy Conservation Code

B. Unless otherwise specified, equipment and materials of the same type and used for the same purpose, shall be products of the same manufacturer.

1.7 CAPACITIES, SIZES AND OPERATING CONDITIONS

A. Capacities, sizes, and conditions specified or shown on drawings shall be regarded as minimum allowable. If the Contractor proposes to furnish any equipment which would have to operate at other than specified conditions to produce final effects, all other directly or indirectly related components of the entire systems (as well as of the structure, finish and other systems in the building) must be properly coordinated to the satisfaction of the Engineer. That is: Operating conditions through the entire system must be such that no motor is overloaded, no equipment operates noisier, faster, or hotter than manufacturer's publication recommends and that no excess stress or demand is imposed on any component of any system or the structure; also that no quality, architectural feature, function or "end result" is affected adversely, in the opinion of the Architect.

B. The Architect/Engineer reserves the right to determine if the contractor's proposed materials and equipment of any one manufacturer is acceptable in lieu of the specified material or equipment.

C. Where materials and equipment are listed on Drawings and specifications as acceptable or equivalent, this does not relieve the contractor and/or manufacturer from providing and proving to Architect/Engineer that their materials and equipment are equivalent to items the Architect/Engineer used as a guide specification.

D. The contractor and manufacturer must confirm to the Architect/Engineer that their equipment and materials will meet the space requirements of the project and that the equipment is easily accessible for maintenance and operation.

1.8 LAYOUT

A. The Contractor's work lines and established heights shall be in strict accordance with drawings and specifications insofar as these drawings and specifications extend. The Contractor shall verify all dimensions shown and establish all elevations and detail dimensions not shown. He shall also correlate the time so that the work will proceed to the best advantage of the complete job as a unit. The Contractor shall be responsible for furnishing in ample time, any information required to revise footing elevations, build all chases and openings in floors, walls, partitions, ceilings, and roofs to provide clearance which may be required to accommodate the work. The contractor shall set all sleeves, anchor bolts, and inserts required to accommodate his equipment before masonry is constructed.

B. The Contractor shall layout his work well enough in advance to foresee any conflicts or interferences with work of other sections so that in case of interference, his layout may be altered to suit the conditions, prior to the installation of any work. This procedure will require constant coordination with all sections of the work.

1.9 DEMOLITION AND SCHEDULE

A. All existing plumbing equipment noted on drawings and listed herein that is to be removed or demolished, shall be removed on schedule and disposed of as hereinafter directed.

B. All items removed shall become the property of the contractor and shall be immediately disposed of offsite at contractor’s expense except as noted on drawings unless otherwise directed by owner.

C. All demolition shall be carefully accomplished in accordance with master construction schedule so as not to remove any item required for support operation during the planned schedule. No item shall be removed until full schedule is worked out with contractors according to Owner’s demands and agreed to in writing by the Engineer.

D. Storage will be arranged during scheduling process. Contractors to provide own storage and security.

E. Contractor doing the demolition of equipment must conform to the Clean Air Act of 1990. Refrigerant must be recovered from any air conditioning or refrigeration equipment prior to disconnecting and disposal. The contractor must own and use recovery equipment to meet this requirement. The contractor will be responsible for disposal of refrigerant, refrigerant oil or equipment.

F. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damage or unserviceable portion and replace with new products of equal capacity and quality. All existing piping to remain shall be permanently capped, new or existing valves are not adequate.

1.10 ACCESSIBILITY

A. All equipment, valves, motors, traps, unions, and all other items which require adjustment, maintenance, repair and observation shall be installed in such a fashion that such maintenance, repair and observation can be readily achieved without undue

difficulty. Where the drawings show these items in locations not conforming to the above, the Contractor shall advise the Architect/Engineer of this conflict prior to bid Date otherwise he shall, at his own expense, relocate such items as directed by the Architect/Engineer. Where such items are installed above inaccessible ceilings or in or behind walls, this contractor shall provide approved access panels unless otherwise directed in these Specifications.

1.11 ARCHITECTURAL DRAWING AND SPECIFICATIONS

A. Each Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floor and ceiling heights, for location of walls, partitions, beams etc., and shall be guided accordingly for the setting of all sleeves and equipment.

B. Under no circumstances shall a Contractor scale the Drawings for the locations of equipment and work.

1.12 COOPERATION WITH OTHER CONTRACTORS

A. Each Contractor shall demand and examine all Drawings and Specifications pertaining to the construction before installing the work described and shown under these Drawings and Specifications. Each Contractor shall cooperate with all other contractors in locating piping, openings, chases, and equipment in order to avoid conflict with any other contractor's work. It is the responsibility of all trades to examine all shop drawings of other trades that would require equipment to occupy the same space and plane within the building to eliminate any potential conflicts. No extra payment will be allowed for relocation of piping, and equipment not installed in accordance with the above instructions, and which interferes with work and equipment of other contractors.

1.13 INSTALLATION OF EQUIPMENT

A. All appliances, materials, and equipment shall be installed and connected in accordance with the best engineering practice and in accordance with manufacturer's instructions and recommendations. All auxiliary piping, special controls, water seals, valves, electrical connections, drains, etc., recommended by the manufacturer, required for proper operation, or required by code shall be furnished and installed complete.

B. All equipment designed and constructed for indoor use shall not be shipped to the site until such time that the equipment is ready for permanent installation in a dry building or may be stored on site provided equipment is stored in a water and moisture tight storage building or job trailer. Covering equipment outdoors with plastic or tarp is not acceptable.

1.14 PROTECTION

A. No piping shall be installed in any part of the building where danger of freezing may exist without adequate protection being given, whether insulation is specified for the

particular piping. All damage resulting from leaking pipes shall be borne by the Contractor under this Division.

B. All work, equipment, and materials shall be protected at all times. All pipe openings shall be closed with caps or plugs during construction. All equipment and accessories shall be tightly covered and protected against dirt, water or other injury during the period of construction.

1.15 CUTTING AND PATCHING

A. All cutting and patching required in connection with the installation of this work, and work due to errors, defective work, ill-timed work or tardiness in properly designating size and location in sufficient time or by failure to notify other trades, shall be done under this section, but only in the manner directed by the Engineer so as to prevent or minimize damage to installed work. Damage as a result of cutting for installation, shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Owner.

B. No cutting of structural members will be permitted, except when prior permission of the Engineer has been obtained. This work must conform in every respect to the surrounding finish and to the quality of workmanship and materials used.

C. Piercing of any waterproofing or roofing shall be done only by the trade involved. After the part piercing the waterproofing has been set in place, the opening made for this purpose shall be filled and made absolutely watertight to the satisfaction of the Engineer.

D. See Section: 220517 - Sleeving, Cutting, Patching, and Repairing for Plumbing.

1.16 FIRE AND SMOKE-STOPPING

A. Fire-stopping and smoke-stopping shall be provided around all piping penetrations of fire rated and/or smoke-rated floors, walls, ceilings or other barriers.

B. The materials used shall be UL 263 or UL 1479 classified and meet ASTM E814 standards and be rated for assemblies where applied.

C. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion, or the required fire resistance.

D. Install penetration seal materials in accordance with manufacturer's instruction.

E. Seal holes or voids may be penetrations to ensure an effective fire and/or smoke barrier.

F. Protect materials from damage on surfaces subject to traffic.

G. Stop insulation flush with wall on insulated pipe and seal edges.

H. All exposed piping passing through floors, ceilings and walls in finished areas shall be fitted with a chrome plated escutcheon of sufficient outside diameter to amply cover

the sleeved opening and ad inside diameter to closely fit the pipe around which it is installed.

1.17 CONCRETE WORK AND ANCHOR BOLTS

A. The Contractor under this Division shall provide all concrete bases, curbs, and pads for all floor and ground mounted equipment unless otherwise indicated.

B. The Contractor under this Division shall verify the sizes and locations of all supports, bases, and pads prior to pouring of same to be certain that the installed units will be compatible.

C. The Contractor under this Division shall set anchor bolts when required for the equipment prior to pouring of concrete. Sizes and exact locations of bolts shall be determined by the manufacturer's recommendations for the equipment served.

D. Concrete work must be provided in strict accordance with Section 03 Concrete Work. As a minimum provide pads using 3500 psi concrete not less than 3.5 inches high reinforced with WI.4 x WI.4 welded wire fabric. Chamfer top and edge corners with 3/4" preformed chamfer strips. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. Slope top to floor drain if drain is provided in pad.

1.18 ACCESS PANELS

A. The Plumbing Contractor shall furnish all other access panels needed for access to valves, open receptacles, etc., in inaccessible locations installed under this Division of the work.

B. Access panels shall have a minimum size of 12" x 12" and shall be centered beneath equipment for accessibility and maintenance. Access panels must be of adequate size to service, observe, remove, and maintain equipment.

C. Access panels shall be equal to the types specified under the Architectural Specifications. As a minimum the access panels shall be equivalent to Cesco Products style FB/FB SS, Besco, Inryco/Milcor, Phillips or equivalent, 14 gauge with vandal proof lock and frame as selected by Architect.

D. Ceiling Types

1. In areas with suspended acoustical tile ceilings (installed on exposed metal grid suspension system so that the tile may be readily removed), equipment, valves, etc., install above these ceilings will be accessible.
2. All plastered ceilings or ceilings having concealed spline type of suspension system will be considered as not removable for accessibility to equipment; therefore, access panels will be required.
3. See Architectural Drawings and Specifications for the types of ceilings throughout the building.

E. Access panels shall be installed by sub-contractor specialized in access panel installation.

1.19 CONNECTION TO EQUIPMENT SPECIFIED IN OTHER SECTIONS

A. Examine all Contract Documents and be thoroughly familiar with all items of equipment in other sections or by Owner, unless otherwise specified or indicated on Drawings. Rough-in for and make final connections to all equipment which requires any of the services specified in this Section and including furnishing and install all valves, P-traps, unions, vacuum breakers and all other specialties as required to make all work and equipment final and operating. It is the intent of the Contract Drawings to detail and indicate all such equipment; however, be responsible for notifying Architect/Engineer in writing of major discrepancies seven (7) days prior to Bid Date; otherwise, all such connections shall be made at no extra cost.

B. Unless specified otherwise, all conduit, wiring and connections for power to plumbing equipment will be provided by Electrical Contractor. Be responsible for correct sequences of operation of all plumbing equipment after all wiring has been completed.

1.20 OPERATING INSTRUCTIONS

A. After all tests have been completed and work accepted by the Owner, a competent representative shall, at a time determined by the Engineer, present verbal and visual instructions to the Owner's personnel in the proper operation of his respective system. For this purpose, each section of work shall be demonstrated and explained to the Owner's personnel and sufficient time allotted for instructions. See Specification Section 220600.

1.21 SAFETY

A. The contractor and his subcontractors for the project shall comply with all applicable Federal, State, and local laws governing safeguards, safety devices, and protective equipment and shall take all other needed actions which they may determine or which the Department may determine to be reasonably necessary to protect the life and health of all employees and personnel on the project, provide for the safety of the public and protect all property affected by the performance of the work covered by the contract.

B. The contractor shall not remove or disturb any suspected hazardous materials, including asbestos-containing materials, lead based paints, electrical equipment containing PCB’s, or any other except as instructed in this contract. If any material not covered by the contract is encountered, notify the Engineer immediately.

1.22 TESTS - GENERAL

A. All tests required to establish the adequacy, quality, safety, completed status, and suitable operation of each system and all components thereof shall be made in the presence of and to the satisfaction of the Engineer or his authorized representative and other representatives of State and local Government. All instruments, labor, and expert service necessary to conduct these tests shall be supplied by the Contractor; power and fuel will be furnished by the Owner.

B. The final inspection and tests are to be made only after the Engineer is satisfied that the work described in these specifications has been completely installed in accordance

with the true spirit and intent of these specifications and that complete preliminary tests were made which indicate adequacy, quality, completion, and satisfactory operation. The acceptance of the work herein specified, shall not in any way prejudice the Owner's right to demand replacement of defective material and/or workmanship.

1.23 CLEANING

A. General: Clean all piping and equipment systems as required to leave the piping and equipment clean and free from scale, silt, contamination, etc., as normally required and as specified herein.

B. Utilities and Equipment: The Contractor shall provide all necessary temporary materials and equipment to clean the piping and equipment installed under this specification. No permanent equipment shall be used for storage, mixing, settling, compressing, pumping, etc., without the approval of the Architect. The Contractor shall supply a separate and independent source of clean, dry, oil-free air for the blowdown of systems requiring this method of cleaning.

C. Use of Chemicals: No chemicals, wetting or drying agents shall be used to clean systems or equipment where the materials of the system undergo any changes in their physical or structural characteristics. In case of any doubt as to the compatibility of any materials to the cleaning solution used, the Contractor shall obtain prior written approval for the use of the solution from the manufacturer of the equipment. Piping systems, equipment, and sub-assemblies shall be cleaned after completion of welding, machining, threading, testing, and any other operations capable of contaminating the system piping or equipment. After cleaning, the permanent strainers shall be removed, cleaned, and replaced. Temporary strainers shall be periodically removed, cleaned, and replaced during cleaning in lines ahead of equipment to protect against particles becoming lodged in the equipment.

D. After the Architect/Engineer has complete examination, this Contractor shall remove all stickers, tags, etc., and shall thoroughly clean all equipment, fixtures, and materials installed under his section of the work.

E. Surplus material, rubbish, and equipment resulting from the work shall be removed from the building and premises by the Contractor upon completion of the work in accordance with the General Conditions.

F. All equipment shall be thoroughly cleaned to "Factory New" condition prior to turning over to owner. Touch up or completely repaint equipment as required.

G. Keep all nameplates on equipment clean and exposed for easy reading.

1.24 WARRANTY AND SERVICE

A. All equipment shall be warranted for a period of at least one (1) year from the date of acceptance, as evidenced by date of substantial completion for the entire project or for the last phase of the project, whichever occurs later, against defective materials, design, and workmanship. In addition to the equipment warranty, the Contractor shall provide all repair and adjustment service necessary for the proper operation of the entire system for a period of one (1) year after the date of acceptance, as evidenced by the date of substantial completion for the entire project or for the last phase of the

project, whichever occurs later. Upon receipt of notice from the Owner's representative of failure of any part of the warranted system or equipment during the warranty period, the affected part shall be replaced promptly with a new part without cost to the Owner. Upon failure to take action within 24 hours after being notified, the work will be accomplished by the Engineer at the expense of the Contractor. See General Conditions and individual equipment specifications. Note that the warranty period of time specified in this section represents the minimum warranty period required for work performed under specification Division 21, 22, and 23. Where the General Conditions and/or individual equipment/system specifications require a warranty period of longer duration or earlier start date than specified in this paragraph, the longer duration/earlier start date shall supersede for those portions of work covered by that specification. In the event the contractor is notified of warranty issues but does not correct or address the warranty issues prior to the end of the specified warranty period, the contractor will not be relieved of the responsibility to correct the deficient items after the warranty end date has passed.

B. Make a minimum of two (2) service calls during guarantee period, free of charge, to check with Owner and to check and repair malfunctioning equipment which was installed. Service calls shall be in the middle and end of guarantee period and as required to maintain systems operation. Dates shall be listed in operating and maintenance manuals, along with contractor's name and phone number.

1.25 ELECTRIC MOTORS

A. All motors shall be designed, tested, and applied in accordance with the applicable standards listed hereinbefore. Motors shall be of sufficient size for the duty to be performed and shall not exceed the full load rating when the driven equipment is operating at specified capacity. Unless otherwise specified, all motors shall be high efficiency type and shall have open frames and continuous-duty classification based on 50 degrees C. ambient temperature. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics. Motors shall meet NEMA high efficiency standards MGI - 1.41.2 for energy efficient polyphase squirrel-cage motor. Efficiency shall be in accordance with MGI - 1.2.55. When motor horse powers required differ from those indicated on the drawings, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, starters and branch-circuit protection at no additional cost to the Owner.

1. Motors shall be rated for continuous duty capable of driving the connected loads without exceeding temperature limitations of the motor insulation. Special Class A moisture-resisting insulation (designed to operate in a 50-degree C. ambient without exceeding a temperature rise rating designated by NEMA for the type of enclosure used) shall be utilized in each motor.

B. Unless otherwise indicated or specified, the electrical components required to operate plumbing equipment, such as, motors, float and pressure switches, solenoid valves, and other devices functioning to control the plumbing equipment, shall be furnished as part of the plumbing equipment, shall be complete and operable, and shall be included under this section of the specifications. All motor starters not part of a motor control center shall be included under this Section and shall be the hand off auto type with 3 over-loads on 3 phase units and 120V control transformer. Conduit and wires required for external electrical connections shall be furnished and are specified under Division 26 - Electrical. Integral phase failure relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure

relay shall have adjustable restart time capabilities. Plumbing contractor shall coordinate staggered restart times as required.

1.26 AS-BUILT DRAWINGS

A. The Contractor shall deliver to the Engineer at the completion of the work, one (1) print of "As-Built" drawings, showing legibly and accurately, plumbing and piping systems with equipment locations shown as actually installed. Changes in original plans shall be neatly shown in red pencil. Each print shall be signed by the sub-contractor who has done the work.

B. During construction the Contractor shall retain a set of blue line drawings on the site for recording all changes. These drawings shall be available for inspection by the Engineer.

1.27 TESTS

A. The Architect/Engineer shall be notified by the Contractor under this Division forty-eight (48) hours in advance of any tests so that the Architect/Engineer or his representative may be present when the tests are run. Leaks or imperfections found shall be corrected and a new test shall be run to the satisfaction of the Architect/Engineer. Upon successful completion of the test, pipe covering may be applied and piping may be concealed. A successful test, even if witnessed, however, does not relieve the Contractor under this Division of the responsibility for any failure during the guarantee period.

B. After pipe fabrication has been completed, all water piping shall be subjected to a hydrostatic test of 100 psi and proven tight and free of leaks for a 24-hour period. Tests shall be applied to the piping before being attached to any equipment which would be damaged by the test pressure. Damage to equipment caused by testing shall be repaired or replaced without additional cost to the Owner.

C. The sanitary sewer piping and sanitary waste, vent and drainage piping installed under this Division in, under, or outside the building shall be tested by means of water, smoke or air in accordance with the West Virginia State Building Code, Division of Water Quality and the local utility company requirements. These shall be made in the presence of the Plumbing Inspector and the Architect/Engineer.

D. No insulation, paint, backfill or other prohibitive covering shall be applied to piping prior to the above tests.

E. Provide all temporary equipment, materials, valves, gauges, etc., required for the preceding tests.

F. The expense of all tests shall be borne by the Contractor under this Division.

1.28 CONTRACTOR FURNISHED DRAWINGS, DESCRIPTIVE DATA AND MANUALS

A. Approval of Materials and Equipment: Within 30 days of receipt of notice to proceed, and before starting installation, the Contractor shall submit to the Architect for approval, in triplicate, lists of materials, fixtures and equipment to be incorporated in

the work. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore shall be submitted with drawings. Where such departures require piping or equipment to be supported otherwise than shown, the details submitted shall include loadings and type and kinds of frames, brackets, stanchions, or other supports necessary. Approved departures shall be made at no additional cost to the Owner. The lists of materials and equipment shall be supported by sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable.

B. Conformance to Agency Requirements: Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Air Moving and Conditioning Association, or the American Society of Heating, Refrigerating and Air Conditioning Engineers, or to be approved by the Underwriters' Laboratories, Inc., the Contractor shall submit proof that the items furnished under this specification conform to such requirements. A certificate or published statement by the manufacturer will be sufficient evidence that the item conforms to the specified requirements. In lieu of such stamp, certificate, or statement, the Contractor may submit written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing, of the specified agencies.

C. Shop Drawings

1. In accordance with the General Conditions, shop drawings shall be submitted on all units of prefabricated materials. Shop drawings shall show, in detail, all parts of the work, fully dimensioned and shall also indicate construction, concealed and other jointing, thickness of materials, method of anchoring and attachment to other materials. Where required for certain work, submit setting and bending diagrams and mark same to correspond with the design drawings, identifying locations of various items. Show types, sizes and locations of sleeves and inserts.
2. The Contractor shall check all shop drawings for completeness and for correctness before submitting the drawings. If major corrections are required on the drawings, the Contractor shall return the drawings to the originator and have the changes made. The Contractor shall indicate his corrections on the prints in green pencil and sign all prints and other material sent to the Engineer.
3. Detail and Erection Drawings: Detail and erection drawings for equipment, piping, and other items of this nature shall be carefully prepared in accord with standard practice and shall show erection plans and member details with all individual parts identified on both the detail sheets and erection plans. All identification markings shall be carefully preserved until after the erection process is completed.
4. Material Data: The Contractor shall submit descriptive data, as required, on pipe, fittings, and valves to be incorporated into the work. This data shall be in sufficient detail to allow the Engineer to determine that the pipe, fittings, and valves meet the requirements of the contract drawings and specifications or that they are an acceptable equal to that specified. All data shall be in the form of manufacturer's or supplier's literature concerning the product and shall indicate

catalog number, conditions of use, application instructions, and/or other information as applicable.

5. Equipment Data: The Contractor shall submit descriptive data on all items of equipment to be furnished and installed under this contract. These submittals shall consist of manufacturer's published catalog information which completely describes component materials, configuration, and rough-in data for plumbing and electrical equipment shall also include cuts, diagrams, characteristic curves and capacity information as applicable. Where more than one item of equipment is employed in the same system, the submittal of equipment data will include special diagrams showing the electrical wiring, interconnecting piping, related controls and relation and operation of the various items of equipment for the entire system.

D. Operating Instructions and Maintenance Manuals, Etc.

1. At completion of the contract, the Owner shall be provided with three (3) bound copies of operations and maintenance instructions, recommended list of spare parts required for a period of one (1) year and a list of any special tools required to maintain the equipment for the various items of the plumbing equipment. Where special tools are required, the Contractor shall furnish two (2) of each such tools to the Owner at no additional contract cost.
2. MANUAL SHALL INCLUDE ALL APPROVED SHOP DRAWINGS OF EQUIPMENT REQUIRING OPERATION AND MAINTENANCE INFORMATION.
3. MANUAL SHALL BE ORGANIZED WITH APPROVED SHOP DRAWING FOLLOWED BY ALL RELATED OPERATION AND MAINTENANCE MATERIAL.
4. EQUIPMENT SHALL BE IDENTIFIED IN ACCORDANCE WITH THE DRAWING NOMENCLATURE AND INCLUDE SUPPLIER OF SAID EQUIPMENT.
5. Instructions shall be included for routine checking of all items requiring continued maintenance.
6. Schematic drawings with actual pieces of plumbing equipment, etc., shall be included; where manufacturer’s parts numbers only are applicable, they shall be included.
7. Detailed operating instructions for plumbing equipment shall be included, as well as general maintenance procedures to be followed on such equipment. Manufacturers maintenance and operation manuals will be required where such are normally available with the equipment, but as such information is often of a general nature and applicable to various models of equipment, such information shall be supplemented by specified typed directions for the particular piece of equipment applicable to this project.

E. Materials, Equipment and Appliances

1. Materials: All materials, equipment, products and incidentals to be furnished by the Contractor shall be new, unless otherwise specified, undamaged and the first line quality product of the manufacturer and/or supplier, except when competitive grades fully meet the standards specified in the various technical sections of these specifications.
2. Standard Products: Except as otherwise approved by the Engineer, the equipment and appliances to be furnished under these specifications shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design. Where two or more units of the same type and class of equipment are required, the units shall be the product of the same manufacturer and shall be identical insofar as possible. The component parts of the products need not be products of one manufacturer.

3. Manufacturer's Directions: Where manufacturer's instructions or recommendations are applicable to the installation or application of materials, the Contractor shall adhere to strict conformance with such instructions or recommendations unless specifically noted to the contrary in these specifications. Where such directions conflict with the drawings and specifications, the Contractor shall inform the Engineer of such conflict and request instructions.
4. Samples: The Contractor shall furnish, for approval, samples of materials, profiles, designs, finishes, etc., which are either required by the various sections of specifications or which the Engineer may request from time to time. Samples shall be clearly identified with adequate information for the Engineer's evaluation.
5. Materials and Equipment Delivered to Jobsite: All items of materials, equipment, supplies, and miscellaneous items to be incorporated into the work shall be delivered to the jobsite with labels, tags, nameplates, and/or containers which clearly indicate the manufacturer's item or catalog number or conformance with the applicable standards stipulated in the technical sections of the specifications. Any item which cannot be verified in the field shall not be included in the work until its identity can be established by the Engineer.

F. Equipment and Material Substitutions

1. Should the Contractor elect to use and install materials which have been approved for use other than specified, he shall be required to make any necessary changes, perform all work and furnish any additional materials and ancillary equipment required to make such substituted materials or equipment function or perform as that specified, at no cost to the Owner. This includes structural, electrical, and/or other affected trades.

1.29 DEFINITIONS

A. Plumbing Contractor: Any contractor whether bidding or working independently or under the supervision of a general contractor and/or construction manager and who installs any type of plumbing work.

B. Plumbing Sub-Contractor: Any contractor contracted to or employed by the plumbing contractor for any work required by the mechanical contractor.

C. Engineer: The consulting mechanical/electrical engineers either consulting to the owners, architects, other engineers, etc.

D. A-E: Shall construe architect and/or engineer. In all situations that involve an architect, it shall construe architect, in all others, engineer.

E. Furnish: Deliver to the site in good condition and turn over to contractor responsible for installation.

F. Provide: Furnish and install in complete working order.

G. Install: Install equipment furnished by others.

H. Indicated: Shown on the drawings or addenda thereto.

I. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on the project. Includes but not limited to: plans, specifications, instructions to bidders, general and special conditions, addenda, alternates, list of materials, list of sub-contractors, unit prices, shop drawings, field orders, change orders, cost breakdown, periodical payment requests, etc.

1.30 INTENT

A. It is the intention of these specifications and all associated drawings to call for finished work, tested and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION 220100

SECTION 220517 – SLEEVING, CUTTING, PATCHING, AND REPAIRING FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements for the Plumbing Contractor related to sleeving, cutting, patching, and repairing associated with plumbing work.

1.2 WORK INCLUDED

A. Sleeves

B. Sleeve Seals

C. Grout

D. Escutcheons

E. Lintels

1.3 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness, round tube closed with longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company (The).
3. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel, Plastic, or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink;recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

2.5 LINTELS

A. New openings under 48" in width: Provide one 3 1/2" x 3 1/2" x 3 1/2" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.

B. New openings 48" to 96" in width: Provide one 3 1/2" x 6" x 3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.

C. New openings over 96" in width: Consult the project structural engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for all openings, sleeves, trenches, etc., that he may require or create by demolition in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.

B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through the walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to go throughout; however, when this is not done, the Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.

C. The Contractor shall notify other trades in due time where he will require openings or chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.

D. The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly made good to the satisfaction of the Engineer.

E. All work improperly done or not done at all as required by the Mechanical Trades in this section, will be performed by the Contractor at the direction of the trade whose work is affected.

3.2 SLEEVES

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

F. Pipes Passing Through Waterproofing Membranes: Pipes passing through floor waterproofing membrane shall be installed through a 4-pound lead-flashing sleeve, or a 0.032-inch thick aluminum sleeve, each with an integral skirt or flange. Flashing sleeve shall be suitably formed, and the skirt of flange shall extend not less than 8 inches from the pipe and shall set over the floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 1 inch above the floor. The annular space between the flashing sleeve and the metal-jacket-covered insulation shall be sealed. At the Contractor's option, pipes passing through floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and a pressure ring with brass bolts. Waterproofing membrane shall be clamped into space and sealant shall be placed in the caulking recess.

G. Pipes Passing Through Roof: Pipes passing through the roof shall be installed where shown on the drawings. Any penetration in roof shall be approved by the Roofing Manufacturer.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 ESCUTCHEONS

A. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

3.5 CUTTING

A. All trades shall coordinate all openings in masonry walls with the General Contractor, and, unless otherwise indicated on the Architectural drawings, shall provide lintels for all openings required for the plumbing work (piping, wall boxes, etc.).

B. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the engineer.

C. Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.

D. Openings in metal building walls shall be made in strict accord with building suppliers recommendations.

3.6 PATCHING AND REPAIRING

A. Patching and repairing made necessary by work performed under this division shall be included as part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the engineer.

B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation or work of this Division, such items shall be repaired and/or replaced to the satisfaction of the engineer.

C. Where the installation or removal of piping, etc. requires or creates the penetration of fire or smoked rated walls, ceilings or floors, the space around such pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor, or ceilings affected.

D. Piping passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe around which it is installed.

E. Where pipes pass through exterior walls, the wall openings shall be sealed air and water tight. This shall include sealing on both sides of the wall to insure air and water does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION 220517

SECTION 220529 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and Equipment Hangers, Supports, and Associated Anchors

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

C. Section 220719 – Plumbing Piping Insulation

D. Section 221000 - Plumbing Piping

1.3 REFERENCES

A. ANSI/ASME B31.1 - Power Piping

1.4 SCOPE

A. This specification shall apply for the design and fabrication of all hangers, supports, anchors and guides. Where piping design is such that exceptions to this specification are necessary, the particular system shall be identified, and the exceptions approved by Engineer prior to installation. See drawings.

1.5 STRUCTURE

A. This section is intended to cover the structural requirements of the piping and equipment. It is not intended to imply that the building structure will support the loads imposed. The contractor shall review the structural drawings for where loads can be applied, what load can be supported and what structural reinforcing is required. Specific questions can be directed to the structural engineer.

1.6 DESIGN

A. All supports and parts shall conform to the latest requirements of the ANSI Code for Pressure Piping B31.1.0, and MSS Standard Practice SP-58, SP-69 and SP-89 except as supplemented or modified by the requirements of this specification.

B. Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.

C. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.

D. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

E. Where possible, steel structural attachments shall be beam clamps. Other attachments shall be as scheduled.

F. All rigid hangers shall provide a means of vertical adjustment after erection.

G. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

H. Where horizontal piping movements are greater than ½ inch, or where the hanger load angularity from the vertical is greater than 4 degrees from the cold to hot position of the pipe, the hanger rod to structural attachment shall be by use of Anvil Fig. 47 and Fig. 299 or the hanger rod and structural attachments shall be offset in such manner that the rod is vertical in the hot position.

I. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.

J. Hangers shall be spaced in accordance with ANSI B31.1.0

K. Where practical, riser piping shall be supported independently of the connected horizontal piping.

1. Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with ANSI B31.1 codes.

L. Supports, guides, and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of support parts shall be based on a temperature gradient of 100 degrees F per inch distance from the outside surface of the pipe.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Anvil, B-Line, Elcen, Mason Industries, Advanced Thermal, Fee & Mason, Piping Specialties, MIRO Industries.

2.2 SHIELDS

A. Shield for Insulated Piping 2 Inches and Smaller: galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support. See schedule for thickness.

B. Shield for Insulated Piping 2 ½ Inches and Larger: Pipe covering protective saddles.

C. Shields for Insulated Cold Water Piping 2 ½ Inches and Larger: Hard block non-conducting saddles in 90-degree segments, 12-inch minimum length, block thickness same as insulation thickness.

D. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.3 HANGER RODS

A. Threaded one end, threaded both ends, threaded continuously.

2.4 INSERTS

A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 PIPE HANGERS, SUPPORTS AND ANCHORS

A. Beam Clamps

1. Beam clamps shall have malleable iron jaws, steel bolt or tie rod, nuts and jamb nuts.
2. C-clamps will not be permitted unless retainer is provided.

B. Finish

1. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.6 ROOF SUPPORTS

A. Roof mounted piping shall be supports by pillow block pipestands as manufacturer by MIRO Industries at 800-768-6978.

PART 3 - - EXECUTION

3.1 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

B. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping indicated in schedule on drawings.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Provide hangers with 1-1/2-inch minimum vertical adjustment.

E. Support riser piping independently of connected horizontal piping.

F. Support horizontal piping as follows:

Nominal Pipe Size	Single Rod Diameter	Thickness of Insulation Shield	Maximum Spacing Ferrous Piping	Copper Tubing	HDPE Piping
3/4" & Under	3/8"	16 gauge	6'	5'	2.5'
1"	3/8"	16 gauge	7'	6'	3'
1 1/4	3/8"	16 gauge	8'	8'	4'
1 ½"&2"	3/8"	16 gauge	9'	8'	4'
2 ½"&3"	½"	12 gauge	12'	8'	4'
4" & 5"	5/8"	12 gauge	14'	8'	4'
6"	3/4"	10 gauge	14'	8'	4'
8"	7/8"	8 gauge	14'	10'	5'

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Pipe Hangers	X	X						
Supports	X	X						
Inserts		X						

END OF SECTION 220529

SECTION 220553 – IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Identification of products installed under Division 21 and 22 including:

1. Plastic Nameplates
2. Plastic Tags
3. Metal Tags
4. Stencils and Paint
5. Plastic Pipe Markers
6. Plastic Tape Pipe Markers
7. Underground Plastic Tape Pipe Markers

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

1.3 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Submit product data and manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seton

2.2 EQUIPMENT AND MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch square.

D. Metal Tags: Brass or aluminum with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

E. Stencils: With clean cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	**Length of Color Field**	**Size of Letters**
3/4" - 1-1/4”	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

1. Stencil Paint: Semi-gloss enamel black unless otherwise indicated.

F. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

G. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

H. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6-inch-wide by 4 mil thick, manufactured for direct burial service.

1. Underground plastic piping to be installed with a tracer wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials and to accept stencil painting.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.

B. Plastic or Metal Tags: Install with corrosive-resistant chain.

C. Stencil Painting: Apply in accordance with manufacturer's instructions.

D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

E. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.

F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

G. Equipment: Identify plumbing equipment such as but not limited to pumps, water heaters, storage tanks, expansion tanks, water treatment devices etc. with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.

H. Controls: Identify control panels and major control components outside panels with plastic nameplates.

I. Valves: Identify valves in main and branch piping with tags.

J. Piping: Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Stenciled painting may be used on insulation. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

3.3 VALVES AND CHARTS

A. The Contractor under this Division shall attach a numbered brass tag to each valve installed under this Contract. Each number shall be prefixed with the “P" for plumbing valves. Tags shall be attached to the valves by means of brass "S" hooks. Tags shall be Seton Name Plate Co., C.H. Hanson Co. or Identifications.

B. A chart headed ""PLUMBING VALVE CHART" shall be prepared. Three original charts shall be prepared and approved by the engineer. One of each approved type chart shall be framed under glass and mounted on the wall in the main mechanical room where directed. Three photocopies of each chart shall be made and shall be submitted through normal shop drawing channels for approval and subsequent owner's files. Each chart shall be formatted as shown below: (All normally closed valves shall have a brass tag marked Normally Closed.)

PLUMBING VALVE CHART
PROJECT NAME
DATE

TAG NO.	VALVE LOCATION	VALVE TYPE/SIZE	VALVE FUNCTION

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Valve Chart	X							
Valve Tags	X	X						
Stencils		X						
Tape		X						
Pipe Markers		X						

END OF SECTION 220553

SECTION 220600 – PLUMBING SYSTEMS DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems and equipment.
2. Training in operation and maintenance of systems, subsystems and equipment.
3. Demonstration and training DVDs.

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

1.3 SUBMITTALS

A. Instruction Program: Submit copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module

1. At completion of training, submit training manual for Owner's use which includes receipts signed by the Owner acknowledging that training took place.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Demonstration and Training DVDs: Provide recording of all demonstrations and training given and submit DVD within ten days of end of each training module.

1. Identification: Provide an applied label with the following:

a. Name of Project
b. Name of Engineer
c. Name of Contractor
d. Date DVD was recorded
e. Description of information recorded.

2. Transcript: Prepared on 8-1/2-by 11-inch paper, punched and bound in heavy-duty, three ring, vinyl-covered binders. Mark appropriate identification on front

and spine of each binder. Include a cover sheet with same label information as the corresponding DVD. Include name of Project and date of DVD on each page.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with operation and maintenance manual information.

PART 2 - PRODUCTS

2.1 DEMONSTRATION AND TRAINING PROGRAM

A. Provide program that includes individual training modules for each system and equipment not a part of a system as required by individual Specification Sections and as follows, but not limited to:

1. Plumbing: Provide demonstration and training by showing Owner personnel the major components of the plumbing system as follows:

a. All plumbing fixture types
b. Overview of sanitary sewer system layout and major components such as cleanouts, manholes, grease trap, plaster trap, etc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner personnel to adjust, operate, and maintain systems, subsystems, and equipment not a part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

C. Schedule training with Owner, through Architect/Engineer, with at least ten days' advance notice.

3.3 DEMONSTRATION AND TRAINING DVDS

A. Engage a qualified individual to record demonstration and training DVDs. Record each training module separately. Include classroom instructions and demonstrations.

B. DVD Format: Provide high-quality DVD in full-size cassettes.

C. Narration: Describe scenes on DVD as DVD is recorded. Include description of items being viewed.

D. Transcript: Provide typewritten transcript of the narration.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Instruction Program	X							
Attendance Record	X							
Demonstration and Training DVDs	X							

END OF SECTION 220600

SECTION 220719 – PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Piping Insulation

B. Jackets and Accessories

1.2 RELATED WORK

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

C. Section 220553 - Identification of Plumbing Piping and Equipment

1.3 QUALITY ASSURANCE

A. Materials: Flame spread smoke developed rating of 25/50 in accordance with ASTM E84.

B. All pipe insulation shall be installed by mechanics specializing in this type of work. The finished product shall present a neat and workmanlike appearance. Insulation shall not be applied until all tests except operating tests have been completed, all foreign material, such as rust, scale, or dirt, has been removed and the surfaces are clean and dry. Insulation shall be clean and dry when installed and during the application of any finish.

C. The insulation, insulating materials and related items shall be delivered to the jobsite in the manufacturer's unopened containers. The containers shall have labels stating the manufacturer's name, contents, quantity, and other pertinent data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulations having the thermal and physical properties of the specific materials specified hereinafter, of any of the following manufacturers, or approved equal, are acceptable.

1. Armstrong
2. Certain Teed/Saint Gobain

3. Johns Mansville
4. Knauf
5. Owens Corning
6. Pittsburgh Corning
7. Rubatex

B. The Engineer reserves the right to determine if the proposed insulating materials of any one manufacturer are acceptable in lieu of the specific insulation selected for the following applications.

2.2 INSULATION

A. Type A glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.23 minimum at 75 degrees F; noncombustible.

B. Type B cellular foam; flexible, plastic; 'k' value of 0.25 minimum at 75 degrees F; ASTM C534. APArmaflex W (white) or APArmaflex SS (black) or equal.

C. Type C vinyl plastisol prefabricated assemblies with 1/8 minimum wall thickness. Trap wrap protective kit by Brocar, Truebro or approved equal.

2.3 JACKETS

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets: One piece, premolded type.

C. Canvas Jackets: UL listed treated cotton fabric, 6 oz/sq. yd.

2.4 ACCESSORIES

A. Insulation Bands: 3/4-inch-wide; 0.015-inch-thick galvanized steel, stainless steel. 0.007-inch 0.18 thick aluminum.

B. Metal Jacket Bands: 3/8-inch-wide; 0.015-inch-thick aluminum. 0.010-inch-thick stainless steel.

C. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.

D. Finishing Cement: ASTM C449.

E. Fibrous Glass Cloth: Unthreaded; 9 oz/sq. yd weight.

F. Adhesives: Compatible with insulation.

G. Treated wooden blocks.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping has been tested and approved.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Continue insulation with vapor barrier through penetrations, except on fire rated walls.

C. In exposed piping, locate insulation and cover seams in least visible locations.

D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used. Insert shall extend around bottom 120 degrees of pipe barrel and shall be included inside vapor barrier jacket where applied. See Section 220529 for shields and hangers.

F. Neatly finish insulation at supports, protrusions, and interruptions.

G. Jackets

1. Indoor, Concealed Applications: Insulated pipes shall have standard jackets, with vapor barrier, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used.
2. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications. Finish with canvas jacket; size for finish painting. Do not use PVC jackets.
3. Flanges, Valves, Anchors, and Fittings: Unless otherwise specified, all flanges, valves, anchors and fittings shall be insulated with factory premolded or field fabricated segments of insulation of the same materials and thickness as the adjoining pipe insulation. When segments of insulation are used, elbows shall be provided with not less than three segments. For other fittings and valves, segments shall be cut to required curvatures, or nesting size sectional insulation shall be used. The segments of the insulation shall be properly placed and jointed with fire-resistant adhesive. After the insulation segments are firmly in place, fire-resistant vapor barrier coating shall be applied over the insulation in two coats with glass tape embedded between coats. The coating shall be applied to a total dry film thickness of 1/16 inch minimum. All glass tape seams shall be terminated neatly at the ends of the unions with insulating cement troweled on the bevel. For piping operating below ambient temperature, the beveled ends shall receive a coat of vapor barrier coating. Where anchors are used and secured directly to low temperature piping, they shall be insulated for a distance

to prevent condensation, but not less than 6 inches from the surface of the pipe insulation. For jacket facing to receive finish painting, the factory applied jacket shall be as specified herein, except that the kraft paper shall be light colored with the kraft paper exposed. Field applied vapor barrier jacket shall conform to the above conditions where finish painting is required.

Piping	**Type**	**Pipe Size (inch)**	**Thickness (inch)**
Domestic Hot Water Supply/Recirculation	A/B	all	1
Domestic Cold-Water	A/B	all	1
Copper Water Piping Below Slab and Inside Walls	B	all	1/2
Chrome Plated Piping to Handicapped Lavatories	C	all	1/2
Chrome Plated Piping to Plumbing Fixtures	None		
Storm Water Piping	A	all	1

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Piping Insulation	X	X						

END OF SECTION 220719

SECTION 221000 – PLUMBING PIPING AND VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and Pipe Fittings

B. Valves

C. Sanitary Sewer Piping

D. Domestic Water Piping

E. Gas Piping

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

C. Section 220553 - Identification for Plumbing Piping and Equipment

D. Section 220719 – Plumbing Piping Insulation

E. Section 221119 – Domestic Water Plumbing Specialties

F. Section 221319 – Sanitary and Storm Piping Specialties

G. Section 224200 - Plumbing Fixtures and Equipment

1.3 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code.

C. Welders Certification: In accordance with ANSI/ASME Section 9.

D. Cast Iron Pipe: All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.

E. Hubless Cast Iron Couplings: All couplings for hubless cast iron soil pipe and fittings shall conform to CISPI 310 and be certified by NSF International.

F. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be "lead-free" in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED INSIDE OF BUILDING.

A. Hub-and-spigot, Cast Iron Pipe and Fittings

1. Pipe and Fittings: ASTM A 74,Service and extra-heavy classes.
2. Gaskets: ASTM C 564, rubber.
3. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

B. Hubless, Cast Iron Pipe and Fittings

1. Pipe and Fittings: ASTM A 888 or CISPI 301.
2. CISPI, Hubless-Piping Couplings:
3. Standards: ASTM C 1277 and CISPI 310.
4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. PVC Pipe and Fittings (House Line):

1. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
2. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
3. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
4. Adhesive Primer: ASTM F 656.
5. Solvent Cement: ASTM D 2564

D. PVC Pipe and Fittings (Between Manholes):

1. PVC Cellular-Core Piping:

a. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
b. Fittings: ASTM D 3034, SDR 35, PVC socket-type fittings.

2. PVC Type PSM Sewer Piping:

a. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
b. Fittings: ASTM D 3034, PVC with bell ends.
c. Gaskets: ASTM F 477, elastomeric seals.

3. Provide tracer wire for all non-metallic piping.

2.2 SANITARY WASTE AND VENT PIPING, INTERIOR, ABOVE GRADE

A. Hub-and-spigot, Cast Iron Pipe and Fittings

1. Pipe and Fittings: ASTM A 74,Service class.
2. Gaskets: ASTM C 564, rubber.

B. Hubless, Cast Iron Pipe and Fittings

1. Pipe and Fittings: ASTM A 888 or CISPI 301.
2. CISPI, Hubless-Piping Couplings:
3. Standards: ASTM C 1277 and CISPI 310.
4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Copper Tube and Fittings

1. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
3. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
4. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
5. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

D. PVC Pipe and Fittings (shall not be used within air plenums)

1. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
2. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
3. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
4. Adhesive Primer: ASTM F 656.
5. Solvent Cement: ASTM D 2564.

2.3 WATER PIPING, INTERIOR

A. Aboveground. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper; cast or wrought copper, solder-joint fittings; and brazed or soldered joints.

B. Below slab. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper; wrought-copper, solder-joint fittings; and brazed joints.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Piping Joining Materials

1. Solder Filler Metals: ASTM B 32, lead-free alloys.
2. Flux: ASTM B 813, water flushable.

3. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 NATURAL GAS PIPING, EXTERIOR ABOVEGROUND

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

2.5 NATURAL GAS PIPING, INTERIOR ABOVEGROUND

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1. Branch connections only.

1. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
2. Coating: PE with flame retardant.
3. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
4. Striker Plates: Steel, designed to protect tubing from penetrations.
5. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
6. Operating-Pressure Rating: 5 psig.

2.6 DIELECTRIC FITTINGS

A. Dielectric Unions: ASSE 1079 Standard; 125 psig minimum pressure rating at 180 deg F; solder-joint copper alloy and threaded ferrous end connections.

B. Dielectric Nipples: IAPMO PS 66 Standard: electroplated steel nipple complying with ASTM F 1545; 300 psig pressure rating at 225 deg F; male threaded or grooved end connections; inert and noncorrosive, propylene lining.

2.7 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one

piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

2.8 GATE VALVES

A. Class 125, RS, Bronze Gate Valves (up to 2 inches):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane, NIBCO, Stockham, Watts.

2. Description:

a. Standard: MSS SP-80, Type 2. CWP Rating: 150 psig. Body Material: Bronze with integral seat and screw-in bonnet. Ends: Threaded and soldered joint. Stem: Bronze. Disc: Solid wedge; bronze. Packing: Asbestos free. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, OS&Y, Iron Gate Valves (over 2 inches):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane, NIBCO, Stockham, Watts.

2. Description:

a. Standard: MSS SP-70, Type I. CWP Rating: 150 psig. Body Material: Gray iron with bolted bonnet. Ends: Flanged. Trim: Bronze. Disc: Solid wedge. Packing and Gasket: Asbestos free.

2.9 BALL VALVES

A. Two-Piece, Bronze Ball Valves (up to 2 inches):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane, NIBCO, Milwaukee, Stockham, Watts.

2. Description:

a. Standard: MSS SP-110. CWP Rating: 150 psig. Body Design: Two piece. Body Material: Bronze. Ends: Threaded and soldered. Seats: PTFE. Stem: Stainless steel. Ball: Stainless steel. Port: Full.

2.10 BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane, NIBCO, Stockham, Watts.

2. Description:

a. Standard: MSS SP-67, Type I. CWP Rating: 150 psig. Body Design: Lug type; suitable for bi-directional dead-end service at rated pressure without use of downstream flange. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron. Seat: EPDM. Stem: One-or-two piece stainless steel. Disc: Aluminum bronze.

2.11 SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc (up to 2 inches):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane, NIBCO, Stockham, Watts.

2. Description:

a. Standard: MSS SP-80, Type 3. CWP Rating: 150 psig. Body Design: Horizontal flow. Body Material: ASTM B 62, bronze. Ends: Threaded or soldered. Disc: Bronze.

B. Class 125, Iron Swing Check Valves with Metal Seats (over 2 inches):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crane, NIBCO, Stockham, Watts.

2. Description:

a. Standard: MSS SP-71, Type I. CWP Rating: 150 psig. Body Design: Clear or full waterway. Body Material: ASTM A 126, gray iron with bolted bonnet. Ends: Flanged or threaded. Trim: Bronze. Gasket: Asbestos free.

2.12 SPRING LOADED CHECK VALVES

A. Class 125, Lift Check Valves with Nonmetalic Disc::

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Crane, NIBCO, Stockham, Watts.

2. Description:

    a. Standard: MSS SP-80, Type 2. CWP Rating: 150 psig. Body Design: Vertical flow. Body Material: ASTM B 61 or ASTM B 62, bronze. Ends: Threaded or soldered. Disc: NBR, PTFE.

2.13 RELIEF VALVES

A. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

B. Manufactured by Apollo, Consolidated, Kunkel, Watts and Zurn.

2.14 MANUAL GAS SHUT-OFF VALVES

A. Two-Piece, Full Port, Bronze Ball Valve with Bronze Trim: MSS SP-110 (up to 2 inches).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A.Y. McDonald Mfg., Brasscraft, Conbraco, Perfection Corp.

2. Description

    a. Body: Bronze, complying with ASTM B 584. Ball: Chrome-plated brass. Stem: Bronze; blowout proof. Seats: Reinforced TFE; blowout proof. Packing: Threaded-body packnut design with adjustable-stem packing. Ends: Threaded, flared, or socket. CWP Rating: 600 psig. Listing: Valves NPS 1and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

B. Cast-Iron, Non-Lubricated Plug Valves: MSS SP-78 (over 2 inches).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A.Y. McDonald Mfg., Mueller Co., Xomox Corp.

2. Description

    a. Body: Cast iron, complying with ASTM A 126, Class B. Plug: Bronze or nickel-plated cast iron. Seat: Coated with thermoplastic. Stem Seat:

Compatible with natural gas. Ends: Threaded or flanged. Pressure Class: 125 psig. Listing: Valves NPS 1and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

C. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. A.Y. McDonald Mfg., Lee Brass Company

2. Description

a. Body: Bronze, complying with ASTM B 584. Plug: Bronze. Ends: Threaded or socket. Pressure Class: 125 psig. Listing: Valves NPS 1and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.15 SOLENOID VALVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Asco, Fisher, Griswold.

B. Description:

1. Action: Either normally open or normally closed in the event of electrical power failure as required by the application. Size to close against the system pressure. Manual override capable. Heavy-duty assembly. Body: Brass. Seats and Discs: NBR or PTFE. Solenoid Enclosure: NEMA 250, Type 4.

2.16 GAUGE COCKS

A. Ashcroft No. 1092; 150 PSIG maximum working pressure; bronze; 1/4" screwed connections; tee handle.

B. All pressure gauges shall be installed with a gauge cock.

2.17 STRAINERS

A. Strainers shall be Y type equal to Leslie, Illinois, or Mueller. Sizes 2 1/2" and larger shall be flanged; sizes 2" and smaller shall be screwed.

B. Water strainers shall be cast iron or brass, designed for 125 lb. steam/200 lbs. WOG working pressure.

C. Strainers shall have a free area of strainer screen a minimum of twice the area of the adjoining pipe. Strainer baskets shall be fabricated from stainless steel or Monel sheet metal; baskets shall have 0.045" (3/64") perforations for water service.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, properly clearing all windows, doors, and other openings.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space. Do not change the designed path of piping, add excessive turns or offsets, or change pipe sizes without first consulting the Engineer.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Slope water piping and arrange to drain at low points.

J. Establish elevations of buried piping outside the building to ensure not less than 3 feet of cover.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.

M. Establish invert elevations, slopes for drainage to be 1/8 inch per foot one percent minimum. Maintain gradients.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

3.3 EXCAVATION AND BACKFILL

A. As part of the work under these sections, provide all excavating and backfilling, including dewatering and shoring required for the introduction and completion of the work. The work performed under this heading must conform to surrounding grounds or finished grade and must be approved by the Engineer.

B. All excavation shall be classified in accordance with the General Conditions of these specifications.

C. Surplus material and materials unsuitable for use as fill or backfill of foundation or trench excavations shall be disposed of off the Owner's property at the Contractor's expense.

D. Borrow material, if required, may not be available on Owner's property and shall be the responsibility of the Contractor to import any required material at his expense.

E. Explosives and blasting shall not be permitted except by written permission of the Engineer.

F. Where adjacent surface areas are disturbed as a result of construction operations or the storage of materials, they shall be cleaned of all debris and restored to original conditions.

G. The Contractor shall be responsible for location in the field the excavation lines shown on the drawings. The location shall be approved by the Engineer before excavation is begun. The Contractor shall use reference points as shown on the drawings for locating control points for earthwork and construction. In the absence of reference points, the Contractor shall locate control points in accordance with the Engineer's instructions.

H. Active utilities shown on the drawings shall be adequately protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered but are not shown on the drawings, the Engineer shall be advised; the work shall be adequately protected, supported or relocated as directed by the Architect. In-active and abandoned utilities encountered in excavating and grading operations shall be reported to the Architect; they shall be removed, plugged or capped as directed by the Architect.

I. Trench Excavation: The bottom of the trenches shall be accurately graded to provide uniform bearing and support for the pipe or concrete trench as shown on the drawings. Pipe shall be supported at every point along its entire length. Unless otherwise indicated, excavation shall be by open cut and trench sides shall be vertical.

The trench bottom shall follow a uniform grade as shown on the drawings in the direction of flow insofar as possible. Where the trench has been excavated below grade, either inadvertently or purposely, the trench shall be backfilled and thoroughly tamped so as to provide full length bearing for the pipe barrel.

J. Laying Pipe: Laying of pipe on blocks, brick or wood to bring the pipe to a uniform invert shall not be permitted. Drainage lines shall be laid conform to the drawings. All pipe joints shall be inspected and approved prior to backfilling.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper pipe system. Sweat solder adapters to pipe.

D. Install ball and/or butterfly valves for shut-off and to isolate equipment, parts of systems, vertical risers and branch piping serving fixtures without a means of shut-off. Valves to be located in such a manner to be accessible for service personnel. Provide access panel(s) if required to access valves.

E. Install ball valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of water pumps.

G. Do not install above grade piping in areas subject to freezing. Where such an area is encountered, notify the engineer for instruction.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual test less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from outlets and from water entry, and analyze in accordance with AWWA C601.

3.6 PAINTING OF GAS PIPING

A. Comply with the requirements in painting specification sections for painting interior and exterior natural gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars and piping specialties, except components with factory-applied paint or protective coating.

1. Alkyd System:

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior enamel.
d. Color: By Owner.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars and piping specialties, except components with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System:

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex.
d. Color: By Owner.

2. Alkyd System:

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior alkyd enamel matching topcoat.
c. Topcoat: Interior alkyd.
d. Color: By Owner.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Sanitary Piping	X	X						
Domestic Water Piping	X	X						
Valves	X	X						
Gas Piping	X	X						

END OF SECTION 221000

SECTION 221119 – DOMESTIC WATER PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Water Hammer Arrestors

B. Thermometers

C. Pressure Gauges

D. Trap Primers

E. Water Pressure-Reducing Valves

F. Balancing Valves

G. Temperature-Actuated, Water Mixing Valves

1.2 RELATED WORK

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

C. Section 221000 - Plumbing Piping

D. Section 224200 - Plumbing Fixtures

1.3 REFERENCES

A. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent

B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers

C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle

D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types

E. ANSI A112.26.1 - Water Hammer Arresters

F. PDI WH-201 Water Hammer Arresters

1.4 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

B. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be “lead-free” in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.

PART 2 - PRODUCTS

2.1 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

B. Manufactured by Amtol, PPP, Sioux Chief, J.R. Smith, Watts and Zurn.

2.2 THERMOMETERS

A. Weiss No. 9VS type vari-angle 9" mercury filled heavy duty type; Marshalltown, Ashcroft, Marsh, or equivalent, Accuracy within 2% of scale span. Brass 3 1/2" (min.) stem complete with separable socker. Stem and socket must be of adequate length to give accurate temperature readings. Install in piping system in strict accordance with manufacturer's requirements. Increase pipe sizing at thermometer as required. Range 30 to 240 degrees F. for hot water piping, and 0 120 degrees F, for heat pump loop water, unless other standard range selected upon submittal. Contractor shall adjust case for readability from floor line.

2.3 PRESURE GAUGES

A. Weiss Series UG 1, Ashcroft, Marsh, Marshalltown or equivalent. 4 1/2" dial, range selected upon submittal; with maximum pointer; brass bourdon tube and socket; 1% accuracy.

B. All pressure gauges shall be installed with lever handle gauge cock and brass straight coil siphon tube.

2.4 DRAINAGE TYPE TRAP-SEAL PRIMER

A. Trap primer shall be listed and certified to ASME 1044, lavatory P-trap with braided 3/8” stainless steel flexible priming make-up water line with 5/8” compression fittings.

B. Manufactured by Sioux Chief, PPP, Inc., and Zurn.

2.5 FLOW SENSING TRAP-SEAL PRIMER

A. Trap primer shall be listed and certified to ASME 1018, constructed of 360 brass with EPDM E70 O-rings and stainless-steel screen.

B. Trap primer shall automatically maintain a constant water seal based on pressure drop across the valve with no adjustments required.

C. Provide with universal distribution unit as specified.

D. Manufactured by Sioux Chief, PPP, Inc., and Zurn.

2.6 PRESSURE SENSING TRAP-SEAL PRIMER SYSTEMS

A. Trap primer shall be listed and certified to ASME 1018 with lead-free body and cap, nitrile O-rings and stainless-steel screen.

B. Trap primer shall be equipped with vacuum breaker ports and internal backflow protection to prevent cross connection.

C. Provide with universal distribution unit as specified.

D. Manufactured by Sioux Chief, PPP, Inc., and Zurn.

2.7 ELECTRONIC TRAP-SEAL PRIMER SYSTEMS

A. Trap primer shall be listed and certified to ASSE 1044 and equipped with solenoid actuating device, ASSE 1001 vacuum breaker, distribution manifold and proper electronic hardware.

B. Trap primer shall be equipped with an ASSE 1010 arrester to protect the solenoid valve.

C. Recessed or surface mounted cabinet to be provided as specified.

D. Manufactured by Sioux Chief, PPP, Inc., and Zurn.

2.8 WATER PRESSURE-REDUCING VALVES

A. Water Regulators

1. Standard: ASSE 1003, 150 psig.
2. Body: Bronze with threaded end connections for NPS 2 and smaller; cast iron with flanged end connections with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
3. Manufactured by Apollo, Conbraco, Watts and Zurn.

B. Water-Control Valves

1. Pilot operated, diaphragm-type, single-seated main water-control valve with initial working pressure of 150 psig minimum with AWWA C550 or FDA-

approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.

2. Cast or ductile iron body with AWWA C550 or FDA-approved, interior epoxy coating. Threaded end connections for NPS 2 and smaller; flanged end connections for NPS 2-1/2 and larger.
3. Manufactured by Apollo, Conbraco, Watts and Zurn.

2.9 BALANCING VALVES

A. Balancing valves shall be of the Lead Free, bi-direction, blow-out resistant, tight shutoff, ball design, with position indicator, memory device, checked metering ports with drip caps and integral drain ports opposite the metering ports. Provide a minimum of 24" of straight run of piping on each side of balancing valve assembly.

B. Manufactured by Armstrong, Nibco, Taco, or Watts.

2.10 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Valve shall be listed to ASSE 1017 and certified to CSA B125 and have an approach temperature of 5 degrees F. Valve shall have an outlet temperature range of 90 – 160 degrees F with a lockable temperature setting feature.

B. Body shall be constructed using Lead Free brass material and be corrosive resistant and feature a single-seat design for positive shut-off. Valve shall have standard union check stops.

C. Manufactured by Powers, Leonard, Watts.

2.11 INSTALLATION

A. General: Install plumbing specialty components, connections, and devices according to manufacturer’s written instructions.

B. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valves, water pressure-reducing valves, solenoid valves, and pumps.

G. Set nonfreezing, nondraining-type post hydrants in concrete or pavement.

H. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

I. Install water-hammer arresters in water piping according to PDI-WH 201.

J. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

K. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

L. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.

M. Secure supplies to supports or substrate.

N. Install individual stop valve in each water supply to plumbing specialties. Use ball valve if specific valve is not indicated.

O. Install water-supply stop valves in accessible locations.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

Q. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

2.12 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing specialties and piping specified in other Division 22 Sections.
2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.
3. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

PART 3 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this

Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Water Hammer Arrestors	X	X						
Thermometers	X	X						
Pressure Gauges	X	X						
Trap Primers	X	X						
Water Pressure Reducing Valve	X	X						
Balancing Valves	X	X						
Water Mixing Valves	X	X						

END OF SECTION 221119

SECTION 221319 – SANITARY AND STORM PIPING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Cleanouts

B. Floor Drains

C. Drainage Piping Specialties

1.2 RELATED WORK

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

C. Section 221000 - Plumbing Piping

D. Section 224200 - Plumbing Fixtures

1.3 REFERENCES

A. ASTM C478 - Precast Reinforced Concrete Manhole Sections

1.4 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

B. Products listed in schedule on drawings shall determine quality and grade required. If other than those listed in schedule are to be used, equivalent or parallel grade shall be used.

C. All drains shall be constructed of the finest quality cast iron, coated with the manufacturer's standard protective paint, and furnished with all items specified. Drain shall be as manufactured by Josam, Sioux Chief, Smith, Wade, Watts and Zurn.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Provide cleanouts as detailed and specified on Drawings. Cleanout types are as follows:

1. Exposed Cast Iron Cleanouts
2. Cast Iron Floor Cleanouts
3. Cast Iron Wall Cleanouts

B. Manufactured by Josam, MIFAB, J.R. Smith, Sioux Chief, Watts, and Zurn.

2.2 FLOOR DRAINS

A. Provide floor drains as detailed and specified on Drawings. Floor drain types are as follows:

1. Cast Iron Floor Drains
2. Manufactured by Josam, MIFAB, J.R. Smith, Sioux Chief, Watts, and Zurn.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains (receptacles):

1. Description: Shop or field fabricated from ASTM A 74, Service class hub-and-spigot cast-iron, soil-pipe fittings or Schedule 40 PVC. Include P-trap, hub-and-spigot riser section: and where required, increaser fitting.

B. Floor Drain, Trap-Seal Primer Fittings

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection. Size: Same as floor drain outlet with NPS ½ side inlet.

C. Air-Gap Fittings

1. ASME A112.1.12, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping. Bronze or cast-iron body.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

F. Assemble open drain fittings and install with top of hub 1 inch above floor.

G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

H. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

I. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

3.2 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Cleanouts	X	X						
Floor Drains	X	X						
Drainage Piping Specialties	X	X						

END OF SECTION 221319

SECTION 221513 - GENERAL-SERVICE COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig (1380 kPa) or less.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene rubber.

D. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 200 psig (1035 and 1380 kPa).

E. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig (1035 kPa) or less.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Plastic pipes, fittings, and valves.
2. Dielectric fittings.
3. Flexible pipe connectors.
4. Safety valves.
5. Pressure regulators. Include rated capacities and operating characteristics.
6. Automatic drain valves.
7. Filters. Include rated capacities and operating characteristics.
8. Lubricators. Include rated capacities and operating characteristics.
9. Quick couplings.
10. Hose assemblies.

1.5 INFORMATIONAL SUBMITTALS

A. Brazing and welding certificates.

B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

B. ASME Compliance:

1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Schedule 40, Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.

1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.

B. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B) and ASTM B 88, Type M (ASTM B 88M, Type C) seamless, drawn-temper, water tube.

1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
3. Copper Unions: ASME B16.22 or MSS SP-123.

C. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.3 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 150 psig (1035 kPa).
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 150 psig (1035 kPa).
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig (1035 kPa).
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.4 FLEXIBLE PIPE CONNECTORS

A. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: 200 psig (1380 kPa) minimum.
2. End Connections, NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections, NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.

B. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: 200 psig (1380 kPa) minimum.
2. End Connections, NPS 2 (DN 50) and Smaller: Threaded steel pipe nipple.
3. End Connections, NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

2.5 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Line Pressure Regulators: Diaphragm or pilot operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig (1380-kPa) minimum inlet pressure, unless otherwise indicated.

C. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig (1380-kPa) minimum working pressure, capable of automatic discharge of collected condensate.

D. Mechanical Filters: Two-stage, mechanical-separation-type, air-line filters. Equip with deflector plates, resin-impregnated-ribbon-type filters with edge filtration, and drain cock. Include mounting bracket if wall mounting is indicated.

E. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal. Include mounting bracket if wall mounting is indicated.

1. Provide with automatic feed device for supplying oil to lubricator.

2.6 QUICK COUPLINGS

A. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

B. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
2. Plug End: Flow-sensor-bleeder, check-valve type with barbed outlet for attaching hose.

2.7 HOSE ASSEMBLIES

A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig (2070-kPa) minimum working pressure, unless otherwise indicated.

1. Hose: Buna-S (SBR) Synthetic textile braid for compressed-air service.
2. Delivery Hose fittings: Male NPT zinc plated
3. Inlet Hose fittings: Zinc plated steel female NPSM 60 degree cone and male NPT adaptor.
4. Hose Clamps: Stainless-steel clamps or bands.
5. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
6. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

B. Hose Reel: Samson, Reel Master 506 series or equal

1. Aluminum construction. Minimum 50 foot hose length and shall have automatic hose retraction. Reel shall have hose stop. Guide arm shall be adjustable on site. Reel shall include all accessories needed to mount to wall or horizontal structure, as shown on plans.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Low-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:

1. NPS 2 (DN 50) and Smaller: Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.
2. NPS 2 (DN 50) and Smaller: Type K or L (Type A or B), copper tube; wrought-copper fittings; and brazed joints.
3. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.
4. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Type K or L (Type A or B), copper tube; wrought-copper fittings; and brazed joints.

B. Drain Piping: Use the following piping materials:

1. NPS 2 (DN 50) and Smaller: Type M (Type C) copper tube; wrought-copper fittings; and brazed or soldered joints.

3.2 VALVE APPLICATIONS

A. Metal General-Duty Valves: Comply with requirements and use valve types specified in Section 221000 “Plumbing Piping and Valves” according to the following:

1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
2. Equipment Isolation NPS 2 (DN 50) and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
3. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections:

1. Use steel companion flange with gasket for connection to steel pipe.
2. Use cast-copper-alloy companion flange with gasket and brazed joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

I. Flanged joints may be used instead of specified joint for any piping or tubing system.

J. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, according to Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F 2014.

K. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

L. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

M. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."

N. Install piping to permit valve servicing.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.

E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."

G. Extruded-Tee Outlets for Copper Tubing: Form branches according to ASTM F 2014, with tools recommended by procedure manufacturer, and using operators qualified according to Part 1 "Quality Assurance" Article.

H. Pressure-Sealed Joints: Join with tools recommended by fitting manufacturer, using operators qualified according to Part 1 "Quality Assurance" Article.

I. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 221000 “Plumbing Piping and Valves.”

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 (DN 50) and Smaller: Use dielectric unions.

C. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install flexible pipe connectors in discharge piping of each air compressor.

B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.

C. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.8 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near air compressors.

C. Install air-line pressure regulators in branch piping to equipment and tools.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

E. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters. Mount on wall at locations indicated.

F. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.

G. Install quick couplings at piping terminals for hose connections.

H. Install hose reel assemblies at hose connections.

3.9 CONNECTIONS

A. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

B. Vertical Piping: MSS Type 8 or 42, clamps.

C. Individual, Straight, Horizontal Piping Runs:

1. 100 Feet (30 m) or Less: MSS Type 1, adjustable, steel clevis hangers.
2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

D. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

E. Base of Vertical Piping: MSS Type 52, spring hangers.

F. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.

G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

H. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 to NPS 1/2 (DN 8 to DN 15): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
2. NPS 3/4 to NPS 1-1/4 (DN 20 to DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 (DN 40): 12 feet (3.7 m) with 3/8-inch (10-mm) rod.
4. NPS 2 (DN 50): 13 feet (4 m) with 3/8-inch (10-mm) rod.
5. NPS 2-1/2 (DN 65): 14 feet (4.3 m) with 1/2-inch (13-mm) rod.
6. NPS 3 (DN 80): 15 feet (4.6 m) with 1/2-inch (13-mm) rod.
7. NPS 3-1/2 (DN 90): 16 feet (4.9 m) with 1/2-inch (13-mm) rod.

I. Install supports for vertical, Schedule 40, steel piping every 15 feet (4.6 m).

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 (DN 8): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 3/4 (DN 20): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
4. NPS 1 (DN 25): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
5. NPS 1-1/4 (DN 32): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
6. NPS 1-1/2 (DN 40): 10 feet (3 m) with 3/8-inch (10-mm) rod.
7. NPS 2 (DN 50): 11 feet (3.4 m) with 3/8-inch (10-mm) rod.
8. NPS 2-1/2 (DN 65): 13 feet (4 m) with 1/2-inch (13-mm) rod.
9. NPS 3 (DN 80): 14 feet (4.3 m) with 1/2-inch (13-mm) rod.
10. NPS 3-1/2 (DN 90): 15 feet (4.6 m) with 1/2-inch (13-mm) rod.

K. Install supports for vertical copper tubing every 10 feet (3 m).

3.11 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.12 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:

1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig (345 kPa) above system operating pressure, but not less than 150 psig (1035 kPa). Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect filters lubricators and pressure regulators for proper operation.

C. Prepare test reports.

END OF SECTION 221513

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial, atmospheric, gas-fired, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of commercial, gas-fired, domestic-water heater, from manufacturer.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1) Storage Tank: Three years.
2) Controls and Other Components: One year(s).

b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Commercial, Atmospheric, Gas-Fired, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Lochinvar, LLC.
   b. Smith, A. O. Corporation.
   c. State Industries.

2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Storage-Tank Construction: ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

   a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

      1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
      2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

   b. Lining: Glass complying with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

4. Factory-Installed Storage-Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.
   b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
   c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
   d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
   e. Jacket: Steel with enameled finish.
   f. Burner: For use with atmospheric, gas-fired, domestic-water heaters and natural-gas fuel.
   g. Temperature Control: Adjustable thermostat.
   h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
   i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Circulating Pump:

1. Provide manufacturer's circulating pump. See schedule for more information.

B. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AMTROL, Inc.
b. Smith, A. O. Corporation.
c. State Industries.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 221000 "Plumbing Piping and Valves."

1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

G. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

H. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters and storage tanks to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 221000 “Plumbing Piping and Valves."

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 221000 "Plumbing Piping and Valves."

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Install thermometer on outlet piping of domestic-water heaters.

G. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

H. Fill domestic-water heaters with water.

I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for gas piping specified in Section 221000 "Plumbing Piping and Valves."

B. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION 223400

SECTION 224200 – PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Water Closets

B. Urinals

C. Lavatories

D. Stainless Steel Sinks

E. Mop Basins

F. Showers

G. Shower Trim

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 220100 - General Provisions for Plumbing Work

C. Section 221000 - Plumbing Piping and Valves

1.3 GENERAL REQUIREMENTS

A. All plumbing fixtures and their installation shall conform to the requirements of the West Virginia State Plumbing Code.

B. Exposed metal work shall be bright chrome-plated brass except as noted.

C. All fixtures shall be by the same manufacturer.

D. All ADA accessible water closets provided with manual flush valve/trip lever shall have the flush valve handle/trip lever mounted on the wide(open) side of the water closet.

E. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be “lead-free” in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.

F. Provide all plumbing fixtures complete with trim required, and connect in a manner conforming to the state and local plumbing codes. Certain fixtures will be furnished by others under other sections of these Specifications. Provide rough-in and final connections including all valves, traps, specialties, etc. required.

G. Provide traps for all waste connections where not furnished with the fixture and or equipment; unions; and stops or shut-off valves for all water connections to all sinks and other items of equipment as required. All exposed pipe and metal, including that within cabinets, shall be chrome plated brass.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acorn, Ancorn Aqua, American Standard, Bemis, Briggs/Proflo, Chicago, Clarion Bathware, Church, Component Hardware, Crane, Delany, Delta, Eljer, Elkay, Encon, Fiat, Guardian, Haws, Intersan, Jay R. Smith, Just, Kohler, Lawler, Leonard, Moen, Murdock, Mustee, Oasis, Olsonite, Powers, Sioux Chief, Sloan, Speakman, Stearn-Williams, Stingray Systems, Symmons, T&S Brass, Toto, Willoughby, Watersaver, Watts and Zurn. SEE SCHEDULES ON DRAWINGS.

B. Products listed in schedule on drawings shall determine quality and grade required. If other than those listed in schedule are to be used, equivalent or parallel grade shall be used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PLUMBING FIXTURE INSTALLATION

A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, back-outlet water closets with fittings and gasket seals.

D. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.

E. Install toilet seats on water closets.

F. Install wall-hanging, back-outlet urinals with gasket seals.

G. Install flush valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for handicapped people to reach.

H. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

I. Fasten recessed, wall-mounted fittings to reinforcement built into walls.

J. Fasten wall-mounted fittings to reinforcement built into walls.

K. Fasten counter-mounting plumbing fixtures to casework.

L. Secure supplies to supports or substrate within pipe space behind fixture.

M. Set shower receptors and mop basins in leveling bed of cement grout as specified by Architect.

N. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.

O. Exception: Omit stop valves on supplies to emergency equipment, except when permitted by authorities having jurisdiction. When permitted, install valve chained and locked in OPEN position.

P. Install water-supply stop valves in accessible locations.

Q. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

R. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

S. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

T. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.

U. Install disposers in sink outlets. Install switch where indicated, or in wall adjacent to sink if location is not indicated.

V. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

W. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant. Coordinate this requirement with Architectural trades.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

B. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.

C. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules for fitting sizes and connection requirements for each plumbing fixture.

D. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.

E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 26 Sections and individual equipment sections.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot-water dispensers, and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at drinking fountains, electric water coolers, faucets, shower valves, and flushometer valves having controls, to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.6 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Water Closets	X	X						
Urinals	X	X		X				
Lavatories	X	X		X				
Stainless Steel Sinks	X	X		X				
Mop Basins	X	X		X				
Showers	X	X		X				
Shower Trim	X	X		X				

END OF SECTION 224200

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Combination units.
2. Water-tempering equipment.

1.3 DEFINITIONS

A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.

D. Tepid: Moderately warm.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For emergency plumbing fixtures to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushing-Fluid Solution: Separate lot and equal to at least 200 percent of amount of solution installed for each self-contained unit.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

C. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 COMBINATION UNITS

A. Plumbed Emergency Shower with Eyewash Combination Units,:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acorn Safety.
b. Bradley Corporation.
c. Guardian Equipment Co.

2. See plans and schedules for product details.

2.2 WATER-TEMPERING EQUIPMENT

A. Hot- and Cold-Water, Water-Tempering Equipment,:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acorn Safety.
b. Bradley Corporation.
c. Guardian Equipment Co.

2. Description: Factory-fabricated equipment with thermostatic mixing valve.

a. Thermostatic Mixing Valve: Designed to provide 70 deg F (21 deg C) tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F (3 deg C) throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
b. Supply Connections: For hot and cold water.

2.3 SOURCE QUALITY CONTROL

A. Certify performance of emergency plumbing fixtures by independent testing organization acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.

B. Install fixtures level and plumb.

C. Fasten fixtures to substrate.

D. Install shutoff valves in water-supply piping to fixtures. Use ball or gate valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Comply with requirements for valves specified in Section 221000 “Plumbing Piping and Valves."

E. Install dielectric fitting in supply piping to emergency equipment if piping and equipment connections are made of different metals.

F. Install thermometers in supply and outlet piping connections to water-tempering equipment.

G. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations.

H. Fill self-contained fixtures with flushing fluid.

3.3 CONNECTIONS

A. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.

B. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.4 IDENTIFICATION

A. Install equipment nameplates or equipment markers on emergency plumbing fixtures and equipment and equipment signs on water-tempering equipment. Comply with requirements for identification materials specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust or replace fixture flow regulators for proper flow.

B. Adjust equipment temperature settings.

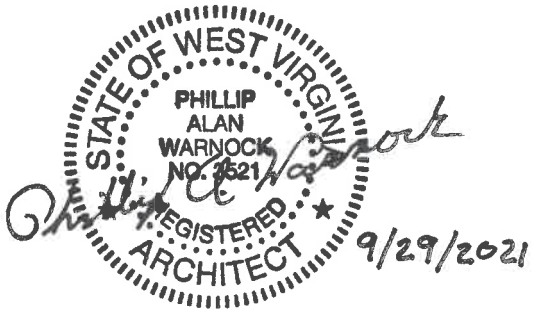
END OF SECTION 224500

Chapman
Technical
Group
a division of
GRW

East Campus Project
Project Number GSD 773207

WV Department of Administration
General Services Division
Charleston, West Virginia

Project Manual
Volume II



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SECTION 230100 – GENERAL PROVISIONS FOR MECHANICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the general arrangement of the mechanical systems and related items to complete the work as shown on the drawings and as specified herein.

B. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

C. The Contractor shall familiarize himself with the work of all other trades, general type construction and the relationship of his work to other sections. He shall examine all working drawings, specifications, and conditions affecting his work. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field and advise the Engineer of any discrepancy before performing any work.

D. The work shall include complete testing of all equipment and piping at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment.

E. The Contractor shall perform all necessary temporary work during construction.

F. Work under this section shall conform to all governing codes, ordinances, and regulations of the City, County, and State.

G. The Contractor shall be responsible for all errors in fabrication, for the correct fitting, installation, and erection of the various mechanical systems as shown on the drawings.

1.2 SCOPE

A. This branch of the work includes coordination with all utility companies; agency review fees and all inspection fees; all labor, materials, tools, excavation and backfill and all equipment necessary for the installation of all Heating, Ventilating and Air Conditioning, System as shown on the Drawings and Specifications and/or as required for complete and operating systems. The work shall include starting, balancing, and the necessary and required tests to insure the proper operation of the complete system.

B. A complete and operating mechanical system shall be provided. See plans for diagrams and details.

C. All work for this project must comply and be in strict accordance with the West Virginia State Building Code, International Building Code, International Plumbing

Code, International Mechanical Code, International Fuel Gas Code, NFPA, ADA, NEC and all local codes and regulations.

D. In general (as a minimum) all materials and equipment must be installed in strict accordance with manufacturer's requirements; and provided with all required controls, internal fusing, relays, piping connections, electrical connections, ductwork connections, etc., to provide for complete and operable systems.

1.3 PERMITS, FEES, CODES AND APPROVALS

A. Permits and Fees

1. All permits, tap on fees and agency review and inspection fees necessary for the complete HVAC, system shall be obtained by the Contractor from the authorities governing such work. The cost of all permits shall be borne by the Contractor.

B. Codes

1. The minimum standard for all mechanical work shall be the current requirements of the West Virginia State Building Code, International Building Code, ADA, International Mechanical Code, International Fuel Gas Code, International Energy Conservation Code, NFPA, and local ordinances.

C. Approvals

1. All work must be approved by the Architect/Engineer, Owner and all related Code Agencies before final payment will be made.
2. As a minimum, the following approval Certificates of Inspection and Approval shall be required:

   a. HVAC Inspection
   b. Local and State Building Inspections.

3. Final payment will be contingent upon all Approval Certificates.

1.4 DRAWINGS AND SPECIFICATIONS

A. Contract drawings for work under this section are in part diagrammatic, intended to convey the scope of work and indicate the general arrangement of equipment, piping and the approximate size and location of equipment and outlets. The Contractor shall follow these drawings in laying out his work and shall verify spaces in which his work will be installed, indicating to the Engineer where any conflicts or overlapping of systems occur. Any item of work not clearly included, specified and/or shown, errors or conflict between Plans (Mechanical, Architectural, Structural or Electrical), Specifications, codes and field conditions, shall be clarified by a written request to the Architect by the Bidder before bidding; otherwise, the bidder shall, at his own expense, supply the proper labor and materials to include these items of work and to make good any damages or defects in his work caused by such error, omission or conflict. Under no circumstances shall a Contractor scale the Drawings for the location of equipment and work.

B. Where job conditions require reasonable changes in indicated locations and arrangement, proposed departures shall be submitted with detailed drawings to the Engineer for approval before any of the proposed work is commenced. All approved departures shall be made at no additional cost to the Owner.

C. The drawings and the specifications are intended to indicate complete and working systems, unless specifically indicated to the contrary. The work includes the furnishing, installing and connecting of a complete working installation in each case to the full extent set forth in the drawings and herein specified. The Contractor shall be responsible for the complete functioning system, unless specifically noted otherwise.

D. The drawings and specifications shall be considered as cooperative, work and material included in either, though not mentioned in both, shall be a part of the work to be accomplished and shall be carried out completely in as thorough manner as if covered by both.

E. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, pipe, traps, valves and accessories as may be required to make a functional installation at no additional cost to the Owner.

F. Mechanical as built "Record Drawings" shall be kept up to date each day. "Record Drawings" shall be reviewed by Architect/Engineer each month with contractor's pay request review.

G. Any deviation in work as shown on plans and specifications must be approved in writing by Architect/Engineer prior to installation.

1.5 EXAMINATION OF SITE

A. Bidders shall visit the site before submitting proposals to satisfy themselves as to the nature and scope of the work and any difficulties attending to the execution.

B. The submission of a proposal will be construed as evidence that such an examination has been made. Later claims for labor, equipment, materials, etc., required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

1.6 EQUIPMENT DESIGN AND INSTALLATION

A. The design, manufacture, testing, and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the applicable standard rules of the following. Where materials are not specifically referred to, but are required, they shall meet the requirements of the applicable code.

1.	NEMA	National Electrical Manufacturer's Assoc.
2.	UL	Underwriter's Laboratories, Inc.
3.	ASME	American Society of Mechanical Engineers
4.	ASTM	American Society of Testing Materials

5.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
6.	BOCA	Building Officials & Code Administrators International, Inc.
7.	NFPA	National Fire Protection Association
8.	AWWA	American Water Works Association
9.	AWS	American Welding Society
10.	AMCA	Air Moving and Conditioning Assoc.
11.	ANSI	American National Standards Institute
12.	NEC	National Electrical Code
13.	AIEE	American Institute of Electrical Eng.
14.	ARI	Air Conditioning & Refrigeration Institute
15.	SMACNA	Sheet Metal and Air Conditioning Contractors National Assoc.
16.	LSDHBC	Local and/or State Division of Housing, Building and Construction
17.	SPC	State Plumbing Code
18.	NPC	National Plumbing Code
19.	OSHA	Occupational Safety and Health Adm.
20.	EPA	Environmental Protection Agency
21.	DOE	U.S. Department of Energy
22.	IMC	International Mechanical Code
23.	IECC	International Energy Conservation Code

B. Unless otherwise specified, equipment and materials of the same type and used for the same purpose, shall be products of the same manufacturer.

1.7 CAPACITIES, SIZES AND OPERATING CONDITIONS

A. Capacities, sizes, and conditions specified or shown on drawings shall be regarded as minimum allowable. If the Contractor proposes to furnish any equipment which would have to operate at other than specified conditions to produce final effects, all other directly or indirectly related components of the entire systems (as well as of the structure, finish and other systems in the building) must be properly coordinated to the satisfaction of the Engineer. That is: Operating conditions through the entire system must be such that no motor is overloaded, no equipment operates noisier, faster, or hotter than manufacturer's publication recommends and that no excess stress or demand is imposed on any component of any system or the structure; also that no quality, architectural feature, function or "end result" is affected adversely, in the opinion of the Architect.

B. The Architect/Engineer reserves the right to determine if the contractor's proposed materials and equipment of any one manufacturer is acceptable in lieu of the specified material or equipment.

C. Where materials and equipment are listed on Drawings and specifications as acceptable or equivalent, this does not relieve the contractor and/or manufacturer from providing and proving to Architect/Engineer that their materials and equipment are equivalent to items the Architect/Engineer used as a guide specification.

D. The contractor and manufacturer must confirm to the Architect/Engineer that their equipment and materials will meet the space requirements of the project and that the equipment is easily accessible for maintenance and operation.

1.8 LAYOUT

A. The Contractor's work lines and established heights shall be in strict accordance with drawings and specifications insofar as these drawings and specifications extend. The Contractor shall verify all dimensions shown and establish all elevations and detail dimensions not shown. He shall also correlate the time so that the work will proceed to the best advantage of the complete job as a unit. The Contractor shall be responsible for furnishing in ample time, any information required to revise footing elevations, build all chases and openings in floors, walls, partitions, ceilings, and roofs to provide clearance which may be required to accommodate the work. The contractor shall set all sleeves, anchor bolts, and inserts required to accommodate his equipment before masonry is constructed.

B. The Contractor shall layout his work well enough in advance to foresee any conflicts or interferences with work of other sections so that in case of interference, his layout may be altered to suit the conditions, prior to the installation of any work. This procedure will require constant coordination with all sections of the work.

1.9 DEMOLITION AND SCHEDULE

A. All existing mechanical equipment noted on drawings and listed herein that is to be removed or demolished, shall be removed on schedule and disposed of as hereinafter directed.

B. All items removed shall become the property of the contractor and shall be immediately disposed of off-site at contractor’s expense except as noted on drawings unless otherwise directed by owner.

C. All demolition shall be carefully accomplished in accordance with master construction schedule so as not to remove any item required for support operation during the planned schedule. No item shall be removed until full schedule is worked out with contractors according to owner’s demands and agreed to in writing by the Engineer.

D. Storage will be arranged during scheduling process. Contractors to provide own storage and security.

E. Contractor doing the demolition of equipment must conform to the Clean Air Act of 1990. Refrigerant must be recovered from any air conditioning or refrigeration equipment prior to disconnecting and disposal. The contractor must own and use recovery equipment to meet this requirement. The contractor will be responsible for disposal of refrigerant, refrigerant oil or equipment.

F. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damage or unserviceable portion and replace with new products of equal capacity and quality. All existing piping to remain shall be permanently capped, new or existing valves are not adequate.

1.10 ACCESSIBILITY

A. All equipment, valves, motors, damper operators, traps, unions, and all other items which require adjustment, maintenance, repair and observation shall be installed in such a fashion that such maintenance, repair and observation can be readily achieved

without undue difficulty. Where the drawings show these items in locations not conforming to the above, the Contractor shall advise the Architect/Engineer of this conflict prior to bid Date otherwise he shall, at his own expense, relocate such items as directed by the Architect/Engineer. Where such items are installed above inaccessible ceilings or in or behind walls, this contractor shall provide approved access panels unless otherwise directed in these Specifications.

1.11 ARCHITECTURAL DRAWING AND SPECIFICATIONS

A. Each Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floor and ceiling heights, for location of walls, partitions, beams etc., and shall be guided accordingly for the setting of all sleeves and equipment.

B. Under no circumstances shall a Contractor scale the Drawings for the locations of equipment and work.

1.12 COOPERATION WITH OTHER CONTRACTORS

A. Each Contractor shall demand and examine all Drawings and Specifications pertaining to the construction before installing the work described and shown under these Drawings and Specifications. Each Contractor shall cooperate with all other contractors in locating piping, openings, chases, and equipment in order to avoid conflict with any other contractor's work. It is the responsibility of all trades to examine all shop drawings of other trades that would require equipment to occupy the same space and plane within the building to eliminate any potential conflicts. No extra payment will be allowed for relocation of piping, and equipment not installed in accordance with the above instructions, and which interferes with work and equipment of other contractors.

1.13 INSTALLATION OF EQUIPMENT

A. All appliances, materials, and equipment shall be installed and connected in accordance with the best engineering practice and in accordance with manufacturer's instructions and recommendations. All auxiliary piping, special controls, water seals, valves, electrical connections, drains, etc., recommended by the manufacturer, required for proper operation, or required by code shall be furnished and installed complete.

B. All equipment designed and constructed for indoor use shall not be shipped to the site until such time that the equipment is ready for permanent installation in a dry building or may be stored on site provided equipment is stored in a water and moisture tight storage building or job trailer. Covering equipment outdoors with plastic or tarp is not acceptable.

1.14 PROTECTION OF EQUIPMENT AND MATERIALS

A. No piping shall be installed in any part of the building where danger of freezing may exist without adequate protection being given, whether or not insulation is specified

for the particular piping. All damage resulting from leaking pipes shall be borne by the Contractor under this Division.

B. All work, equipment, and materials shall be protected at all times. All pipe and ductwork openings shall be closed with caps or plugs during construction. All equipment and accessories shall be tightly covered and protected against dirt, water or other injury during the period of construction.

C. If the permanent HVAC equipment is used during construction period for temporary heating, cooling and ventilating, the equipment must be carefully protected, and filters changes at minimum of once a week. All return air and exhaust air ductwork used in temporary HVAC systems during construction period must be filtered at each opening to prevent construction dust from entering the ductwork system.

D. Before the building is turned over to the Owner all of the equipment must be carefully cleaned of debris and dust, coils cleaned and flushed out, new filters installed, and all ductwork cleaned of debris and dust.

1.15 PROTECTION FROM MOVING PARTS

A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded.

1.16 CUTTING AND PATCHING

A. All cutting and patching required in connection with the installation of this work, and work due to errors, defective work, ill-timed work or tardiness in properly designating size and location in sufficient time or by failure to notify other trades, shall be done under this section, but only in the manner directed by the Engineer so as to prevent or minimize damage to installed work. Damage as a result of cutting for installation, shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Owner.

B. No cutting of structural members will be permitted, except when prior permission of the Engineer has been obtained. This work must conform in every respect to the surrounding finish and to the quality of workmanship and materials used.

C. Piercing of any waterproofing or roofing shall be done only by the trade involved. After the part piercing the waterproofing has been set in place, the opening made for this purpose shall be filled and made absolutely watertight to the satisfaction of the Engineer.

D. See Section: 230517 - Sleeving, Cutting, Patching and Repairing - Mechanical

1.17 FIRE AND SMOKE-STOPPING

A. Fire-stopping and smoke-stopping shall be provided around all piping and ductwork penetrations of fire rated and/or smoke-rated floors, walls, ceilings or other barriers.

B. The materials used shall be UL 263 or UL 1479 classified and meet ASTM E814 standards and be rated for assemblies where applied.

C. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion, or the required fire resistance.

D. Install penetration seal materials in accordance with manufacturer's instruction.

E. Seal holes or voids may be penetrations to ensure an effective fire and/or smoke barrier.

F. Protect materials from damage on surfaces subject to traffic.

G. Stop insulation flush with wall on insulated pipe and seal edges.

H. All exposed piping passing through floors, ceilings and walls in finished areas shall be fitted with a chrome plated escutcheon of sufficient outside diameter to amply cover the sleeved opening and ad inside diameter to closely fit the pipe around which it is installed.

I. Galvanized sheet metal collars shall be provided around all ducts, equipment, etc., exposed in finished areas. Where such openings are finished and the space around the unit is small, the collar may be omitted with the approval of the Architect.

1.18 CONCRETE WORK AND ANCHOR BOLTS

A. The Contractor under this Division shall provide all concrete bases, curbs, and pads for all floor and ground mounted equipment unless otherwise indicated.

B. The Contractor under this Division shall verify the sizes and locations of all supports, bases, and pads prior to pouring of same to be certain that the installed units will be compatible.

C. The Contractor under this Division shall set anchor bolts when required for the equipment prior to pouring of concrete. Sizes and exact locations of bolts shall be determined by the manufacturer's recommendations for the equipment served.

D. Concrete work must be provided in strict accordance with Section 03 Concrete Work. As a minimum provide pads using 3500 psi concrete not less than 3.5 inches high reinforced with WI.4 x WI.4 welded wire fabric. Chamfer top and edge corners with 3/4" preformed chamfer strips. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. Slope top to floor drain if drain is provided in pad.

1.19 ACCESS PANELS

A. The Mechanical Contractor shall furnish all other access panels needed for access to valves, open receptacles, vents, fire dampers, mechanical units, etc., in inaccessible locations installed under this Division of the work.

B. Access panels shall have a minimum size of 12" x 12" and shall be centered beneath equipment for accessibility and maintenance. Access panels must be of adequate size to service, observe, remove, and maintain equipment.

C. Access panels shall be equal to the types specified under the Architectural Specifications. As a minimum the access panels shall be equivalent to Cesco Products style FB/FB SS, Besco, Inryco/Milcor, Phillips or equivalent, 14 gauge with vandal proof lock and frame as selected by Architect.

D. Ceiling Types

1. In areas with suspended acoustical tile ceilings (installed on exposed metal grid suspension system so that the tile may be readily removed), equipment, valves, etc., install above these ceilings will be considered to be accessible.
2. All plastered ceilings or ceilings having concealed spline type of suspension system will be considered as not removable for accessibility to equipment; therefore, access panels will be required.
3. See Architectural Drawings and Specifications for the types of ceilings throughout the building.

E. Access panels shall be installed by sub-contractor specialized in access panel installation.

1.20 CONNECTION TO EQUIPMENT SPECIFIED IN OTHER SECTIONS

A. Examine all Contract Documents and be thoroughly familiar with all items of equipment in other sections or by Owner, unless otherwise specified or indicated on Drawings. Rough-in for and make final connections to all equipment which requires any of the services specified in this Section and including furnishing and install all valves, P-traps, unions, vacuum breakers and all other specialties as required to make all work and equipment final and operating. It is the intent of the Contract Drawings to detail and indicate all such equipment; however, be responsible for notifying Architect/Engineer in writing of major discrepancies seven (7) days prior to Bid Date; otherwise, all such connections shall be made at no extra cost.

B. Unless specified otherwise, all conduit, wiring and connections for power to mechanical equipment will be provided by Electrical Contractor. Be responsible for correct sequences of operation of all mechanical equipment after all wiring has been completed.

1.21 OPERATING INSTRUCTIONS

A. After all tests have been completed and work accepted by the Owner, a competent representative shall, at a time determined by the Engineer, present verbal and visual instructions to the Owner's personnel in the proper operation of his respective system. For this purpose, each section of work shall be demonstrated and explained to the Owner's personnel and sufficient time allotted for instructions. See Specification Section 230600.

1.22 SAFETY

A. The contractor and his subcontractors for the project shall comply with all applicable Federal, State, and local laws governing safeguards, safety devices, and protective equipment and shall take all other needed actions which they may determine or which the Department may determine to be reasonably necessary to protect the life and health of all employees and personnel on the project, provide for the safety of the public and protect all property affected by the performance of the work covered by the contract.

B. The contractor shall not remove or disturb any suspected hazardous materials, including asbestos-containing materials, lead based paints, electrical equipment containing PCB's, or any other except as instructed in this contract. If any material not covered by the contract is encountered, notify the Engineer immediately.

1.23 TESTS - GENERAL

A. All tests required to establish the adequacy, quality, safety, completed status, and suitable operation of each system and all components thereof shall be made in the presence of and to the satisfaction of the Engineer or his authorized representative and other representatives of State and local Government. All instruments, labor, and expert service necessary to conduct these tests shall be supplied by the Contractor; power and fuel will be furnished by the Owner.

B. The final inspection and tests are to be made only after the Engineer is satisfied that the work described in these specifications has been completely installed in accordance with the true spirit and intent of these specifications and that complete preliminary tests were made which indicate adequacy, quality, completion, and satisfactory operation. The acceptance of the work herein specified, shall not in any way prejudice the Owner's right to demand replacement of defective material and/or workmanship.

1.24 CLEANING

A. General: Clean all piping and equipment systems as required to leave the piping and equipment clean and free from scale, silt, contamination, etc., as normally required and as specified herein.

B. Utilities and Equipment: The Contractor shall provide all necessary temporary materials and equipment to clean the piping and equipment installed under this specification. No permanent equipment shall be used for storage, mixing, settling, compressing, pumping, etc., without the approval of the Architect. The Contractor shall supply a separate and independent source of clean, dry, oil-free air for the blowdown of systems requiring this method of cleaning.

C. Use of Chemicals: No chemicals, wetting or drying agents shall be used to clean systems or equipment where the materials of the system undergo any changes in their physical or structural characteristics. In case of any doubt as to the compatibility of any materials to the cleaning solution used, the Contractor shall obtain prior written approval for the use of the solution from the manufacturer of the equipment. Piping systems, equipment, and sub-assemblies shall be cleaned after completion of welding, machining, threading, testing, and any other operations capable of contaminating the system piping or equipment. After cleaning, the permanent strainers shall be removed,

cleaned, and replaced. Temporary strainers shall be periodically removed, cleaned, and replaced during cleaning in lines ahead of equipment to protect against particles becoming lodged in the equipment.

D. After the Architect/Engineer has complete examination, this Contractor shall remove all stickers, tags, etc., and shall thoroughly clean all equipment, fixtures, and materials installed under his section of the work.

E. Surplus material, rubbish, and equipment resulting from the work shall be removed from the building and premises by the Contractor upon completion of the work in accordance with the General Conditions.

F. All equipment shall be thoroughly cleaned to "Factory New" condition prior to turning over to owner. Touch up or completely repaint equipment as required.

G. Keep all nameplates on equipment clean and exposed for easy reading.

1.25 WARRANTY AND SERVICE

A. All equipment shall be warranted for a period of at least one (1) year from the date of acceptance, as evidenced by date of substantial completion for the entire project or for the last phase of the project, whichever occurs later, against defective materials, design, and workmanship. In addition to the equipment warranty, the Contractor shall provide all repair and adjustment service necessary for the proper operation of the entire system for a period of one (1) year after the date of acceptance, as evidenced by the date of substantial completion for the entire project or for the last phase of the project, whichever occurs later. Upon receipt of notice from the Owner's representative of failure of any part of the warranted system or equipment during the warranty period, the affected part shall be replaced promptly with a new part without cost to the Owner. Upon failure to take action within 24 hours after being notified, the work will be accomplished by the Engineer at the expense of the Contractor. See General Conditions and individual equipment specifications. Note that the warranty period of time specified in this section represents the minimum warranty period required for work performed under specification Division 21, 22 and 23. Where the General Conditions and/or individual equipment/system specifications require a warranty period of longer duration or earlier start date than specified in this paragraph, the longer duration/earlier start date shall supersede for those portions of work covered by that specification. In the event the contractor is notified of warranty issues but does not correct or address the warranty issues prior to the end of the specified warranty period, the contractor will not be relieved of the responsibility to correct the deficient items after the warranty end date has passed.

B. The Contractor shall provide a labor warranty and a service warranty for the first year. The first year start date shall be as defined in the paragraph above. The Contractor shall provide all labor associated with the one (1) year equipment warranty. The Contractor shall also provide a service contract for the first year. The service contract shall include monthly filter changes. The filters shall be dated when installed and a filter log shall be kept on site.

1.26 ELECTRIC MOTORS

A. All motors shall be designed, tested and applied in accordance with the applicable standards listed hereinbefore. Motors shall be of sufficient size for the duty to be performed and shall not exceed the full load rating when the driven equipment is operating at specified capacity. Unless otherwise specified, all motors shall be high efficiency type and shall have open frames and continuous-duty classification based on 50 degrees C. ambient temperature. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics. Motors shall meet NEMA high efficiency standards MGI - 1.41.2 for energy efficient polyphase squirrel-cage motor. Efficiency shall be in accordance with MGI - 1.2.55. When motor horse powers required differ from those indicated on the drawings, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, starters and branch-circuit protection at no additional cost to the Owner.

1. Motors shall be rated for continuous duty capable of driving the connected loads without exceeding temperature limitations of the motor insulation. Special Class A moisture-resisting insulation (designed to operate in a 122-degree F. ambient without exceeding a temperature rise rating designated by NEMA for the type of enclosure used) shall be utilized in each motor.

B. Unless otherwise indicated or specified, the electrical components required to operate mechanical equipment, such as, motors, float and pressure switches, solenoid valves, and other devices functioning to control the mechanical equipment, shall be furnished as part of the mechanical equipment, shall be complete and operable, and shall be included under this section of the specifications. All motor starters not part of a motor control center shall be included under this Section and shall be the hand off auto type with 3 over-loads on 3 phase units and 120V control transformer. Conduit and wires required for external electrical connections shall be furnished and are specified under DIVISION 26 - Electrical. Integral phase failure relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Mechanical contractor shall coordinate staggered restart times as required.

1.27 DRIVES

A. Each belt-connected motor-driven unit or fan shall be provided with a variable pitch V-belt drive.

B. Sheaves shall be of cast iron or of steel, statically and dynamically balanced, bored to fit properly on the shafts and secured with key of proper size. Sheaves having set screws alone will not be permitted. Sheaves shall be variable pitched and shall be designed to give the required rpm at approximately the mid-position of adjustment. Pitch diameters of sheaves shall be not less than 3.0 inches for "A" section belts; 5.4 inches for "B" section belts; 9.0 inches for "C" section belts; and 13.0 inches for "D" section belts.

C. Belts shall be selected for a minimum service factor of 1.5 (based on motor nameplate horsepower) and selected and matched in sets for equal tension.

D. All other drives shall be as described under the respective equipment paragraph of these Specifications, as applicable.

1.28 AS-BUILT DRAWINGS

A. The Contractor shall deliver to the Engineer at the completion of the work, one (1) print of "As-Built" drawings, showing legibly and accurately, mechanical and piping systems with equipment locations shown as actually installed. Changes in original plans shall be neatly shown in red pencil. Each print shall be signed by the sub-contractor who has done the work.

B. During construction the Contractor shall retain a set of blue line drawings on the site for recording all changes. These drawings shall be available for inspection by the Engineer.

1.29 TESTS

A. The Architect/Engineer shall be notified by the Contractor under this Division forty-eight (48) hours in advance of any tests so that the Architect/Engineer or his representative may be present when the tests are run. Leaks or imperfections found shall be corrected and a new test shall be run to the satisfaction of the Architect/Engineer. Upon successful completion of the test, pipe covering may be applied, and piping may be concealed. A successful test, even if witnessed, however, does not relieve the Contractor under this Division of the responsibility for any failure during the guarantee period.

B. After pipe fabrication has been completed, all water piping shall be subjected to a hydrostatic test of 100 psi and proven tight and free of leaks for a 24-hour period. Tests shall be applied to the piping before being attached to any equipment which would be damaged by the test pressure. Damage to equipment caused by testing shall be repaired or replaced without additional cost to the Owner.

C. Exterior water piping shall be tested in strict compliance with local water company. The minimum hydrostatic test pressure is 1 1/2 times the water pressure serving the site.

D. No insulation, paint, backfill or other prohibitive covering shall be applied to piping prior to the above tests.

E. Provide all temporary equipment, materials, valves, gauges, etc., required for the preceding tests.

F. The expense of all tests shall be borne by the Contractor under this Division.

G. In addition to the testing specified above the contractor shall perform the following HVAC systems tests and place the system(s) in operation to demonstrate that all features of the system(s) including instrumentation, controls and equipment function as specified for final acceptance.

1. At such time as the Engineer determines that the new heating, ventilating and cooling system is ready to be placed into service, the Contractor shall place the new equipment in operation and demonstrate that the safety devices are in proper working order to the satisfaction of the Engineer.
2. The Contractor shall then maintain operation and demonstrate each system's capability of producing at full load capacity. Within 24 hours after the systems have been satisfactorily tested, Owner operating personnel will relieve the

Contractor of the operations and the Contractor shall continue his work on a joint occupation basis.

3. Depending on the status of the work, the Contractor may at his option conduct other required tests concurrent with, prior to, or following the system testing, providing the Engineer is satisfied the installation is in conformance with the specifications. However, all features of the system(s) shall be tested individually for proper operation at partial and full load conditions and collectively where normal operations require the several components to operate concurrently to constitute an acceptable system.
4. Final acceptance of the entire installation will be based on an acceptable demonstration that all components, local and remote, respond to safety manual and Automatic System controls. During this test the Contractor shall cause simulated perturbations for which the control system is designed to respond. All control, monitor and readout points in the system shall function properly before final acceptance is made.

1.30 CONTRACTOR FURNISHED DRAWINGS, DESCRIPTIVE DATA AND MANUALS

A. Approval of Materials and Equipment: Within 30 days of receipt of notice to proceed, and before starting installation, the Contractor shall submit to the Architect for approval, in triplicate, lists of materials, fixtures and equipment to be incorporated in the work. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore shall be submitted with drawings. Where such departures require piping or equipment to be supported otherwise than shown, the details submitted shall include loadings and type and kinds of frames, brackets, stanchions, or other supports necessary. Approved departures shall be made at no additional cost to the Owner. The lists of materials and equipment shall be supported by sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable.

B. Conformance to Agency Requirements: Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Air Moving and Conditioning Association, or the American Society of Heating, Refrigerating and Air Conditioning Engineers, or to be approved by the Underwriters' Laboratories, Inc., the Contractor shall submit proof that the items furnished under this specification conform to such requirements. A certificate or published statement by the manufacturer will be sufficient evidence that the item conforms to the specified requirements. In lieu of such stamp, certificate, or statement, the Contractor may submit written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing, of the specified agencies.

C. Shop Drawings

1. In accordance with the General Conditions, shop drawings shall be submitted on all units of prefabricated materials. Shop drawings shall show, in detail, all parts of the work, fully dimensioned and shall also indicate construction, concealed and other jointing, thickness of materials, method of anchoring and attachment to other materials. Where required for certain work, submit setting

and bending diagrams and mark same to correspond with the design drawings, identifying locations of various items. Show types, sizes and locations of sleeves and inserts.

2. The Contractor shall check all shop drawings for completeness and for correctness before submitting the drawings. If major corrections are required on the drawings, the Contractor shall return the drawings to the originator and have the changes made. The Contractor shall indicate his corrections on the prints in green pencil and sign all prints and other material sent to the Engineer.
3. Detail and Erection Drawings: Detail and erection drawings for equipment, piping and other items of this nature shall be carefully prepared in accord with standard practice and shall show erection plans and member details with all individual parts identified on both the detail sheets and erection plans. All identification markings shall be carefully preserved until after the erection process is completed.
4. Material Data: The Contractor shall submit descriptive data, as required, on pipe, fittings and valves to be incorporated into the work. This data shall be in sufficient detail to allow the Engineer to determine that the pipe, fittings and valves meet the requirements of the contract drawings and specifications or that they are an acceptable equal to that specified. All data shall be in the form of manufacturer's or supplier's literature concerning the product and shall indicate catalog number, conditions of use, application instructions, and/or other information as applicable.
5. Equipment Data: The Contractor shall submit descriptive data on all items of equipment to be furnished and installed under this contract. These submittals shall consist of manufacturer's published catalog information which completely describes component materials, configuration and rough-in data for mechanical and electrical equipment shall also include cuts, diagrams, characteristic curves and capacity information as applicable. Where more than one item of equipment is employed in the same system, the submittal of equipment data will include special diagrams showing the electrical wiring, interconnecting piping, related controls and relation and operation of the various items of equipment for the entire system.

D. Operating Instructions and Maintenance Manuals, Etc.

1. At completion of the contract, the Owner shall be provided with three (3) bound copies of operations and maintenance instructions, recommended list of spare parts required for a period of one (1) year and a list of any special tools required to maintain the equipment for the various items of the mechanical equipment. Where special tools are required, the Contractor shall furnish two (2) of each such tools to the Owner at no additional contract cost.
2. MANUAL SHALL INCLUDE ALL APPROVED SHOP DRAWINGS OF EQUIPMENT REQUIRING OPERATION AND MAINTENANCE INFORMATION.
3. MANUAL SHALL BE ORGANIZED WITH APPROVED SHOP DRAWING FOLLOWED BY ALL RELATED OPERATION AND MAINTENANCE MATERIAL.
4. EQUIPMENT SHALL BE IDENTIFIED IN ACCORDANCE WITH THE DRAWING NOMENCLATURE AND INCLUDE SUPPLIER OF SAID EQUIPMENT.
5. Instructions shall be included for routine checking of all items requiring continued maintenance.
6. Schematic drawings with actual pieces of mechanical equipment, etc., shall be included; where manufacturer’s parts numbers only are applicable, they shall be included.
7. Detailed operating instructions for mechanical equipment shall be included, as well as general maintenance procedures to be followed on such equipment.

Manufacturers maintenance and operation manuals will be required where such are normally available with the equipment, but as such information is often of a general nature and applicable to various models of equipment, such information shall be supplemented by specified typed directions for the particular piece of equipment applicable to this project.

E. Materials, Equipment and Appliances

1. Materials: All materials, equipment, products and incidentals to be furnished by the Contractor shall be new, unless otherwise specified, undamaged and the first line quality product of the manufacturer and/or supplier, except when competitive grades fully meet the standards specified in the various technical sections of these specifications.
2. Standard Products: Except as otherwise approved by the Engineer, the equipment and appliances to be furnished under these specifications shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design. Where two or more units of the same type and class of equipment are required, the units shall be the product of the same manufacturer and shall be identical insofar as possible. The component parts of the products need not be products of one manufacturer.
3. Manufacturer's Directions: Where manufacturer's instructions or recommendations are applicable to the installation or application of materials, the Contractor shall adhere to strict conformance with such instructions or recommendations unless specifically noted to the contrary in these specifications. Where such directions are in conflict with the drawings and specifications, the Contractor shall inform the Engineer of such conflict and request instructions.
4. Samples: The Contractor shall furnish, for approval, samples of materials, profiles, designs, finishes, etc., which are either required by the various sections of specifications or which the Engineer may request from time to time. Samples shall be clearly identified with adequate information for the Engineer's evaluation.
5. Materials and Equipment Delivered to Jobsite: All items of materials, equipment, supplies and miscellaneous items to be incorporated into the work shall be delivered to the jobsite with labels, tags, nameplates and/or containers which clearly indicate the manufacturer's item or catalog number or conformance with the applicable standards stipulated in the technical sections of the specifications. Any item which cannot be verified in the field shall not be included in the work until its identity can be established by the Engineer.

F. Equipment and Material Substitutions

1. Should the Contractor elect to use and install materials which have been approved for use other than specified, he shall be required to make any necessary changes, perform all work and furnish any additional materials and ancillary equipment required to make such substituted materials or equipment function or perform as that specified, at no cost to the Owner. This includes structural, electrical and/or other affected trades.

1.31 DEFINITIONS

A. Mechanical Contractor: Any contractor whether bidding or working independently or under the supervision of a general contractor and/or construction manager and who installs any type of mechanical work.

B. Mechanical Sub-Contractor: Any contractor contracted to or employed by the mechanical contractor for any work required by the mechanical contractor.

C. Engineer: The consulting mechanical/electrical engineers either consulting to the owners, architects, other engineers, etc.

D. A-E: Shall construe architect and/or engineer. In all situations that involve an architect, it shall construe architect, in all others, engineer.

E. Furnish: Deliver to the site in good condition and turn over to contractor responsible for installation.

F. Provide: Furnish and install in complete working order.

G. Install: Install equipment furnished by others.

H. Indicated: Shown on the drawings or addenda thereto.

I. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on the project. Includes but not limited to: plans, specifications, instructions to bidders, general and special conditions, addenda, alternates, list of materials, list of sub-contractors, unit prices, shop drawings, field orders, change orders, cost breakdown, periodical payment requests, etc.

1.32 INTENT

A. It is the intention of these specifications and all associated drawings to call for finished work, tested and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION 230100

SECTION 230517 – SLEEVING, CUTTING, PATCHING AND REPAIRING FOR MECHANICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements for the Mechanical Contractor related to sleeving, cutting, patching, and repairing associated with mechanical work.

1.2 WORK INCLUDED

A. Sleeves

B. Sleeve Seals

C. Grout

D. Escutcheons

E. Lintels

1.3 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness, round tube closed with longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company (The).
3. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel, Plastic, or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

2.5 LINTELS

A. New openings under 48" in width: Provide one 3 1/2" x 3 1/2" x 3 1/2" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.

B. New openings 48" to 96" in width: Provide one 3 1/2" x 6" x 3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.

C. New openings over 96" in width: Consult the project structural engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for all openings, sleeves, trenches, etc., that he may require or create by demolition in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.

B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through the walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to go throughout; however, when this is not done, the Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.

C. The Contractor shall notify other trades in due time where he will require openings or chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.

D. The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly made good to the satisfaction of the Engineer.

E. All work improperly done or not done at all as required by the Mechanical Trades in this section, will be performed by the Contractor at the direction of the trade whose work is affected.

3.2 SLEEVES

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

F. Pipes Passing Through Waterproofing Membranes: Pipes passing through floor waterproofing membrane shall be installed through a 4-pound lead-flashing sleeve, or a 0.032-inch thick aluminum sleeve, each with an integral skirt or flange. Flashing sleeve shall be suitably formed, and the skirt of flange shall extend not less than 8 inches from the pipe and shall set over the floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 1 inch above the floor. The annular space between the flashing sleeve and the metal-jacket-covered insulation shall be sealed. At the Contractor's option, pipes passing through floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and a pressure ring with brass bolts. Waterproofing membrane shall be clamped into space and sealant shall be placed in the caulking recess.

G. Pipes Passing Through Roof: Pipes passing through the roof shall be installed where shown on the drawings. Any penetration in roof shall be approved by the Roofing Manufacturer.

H. Openings for ductwork, fixtures, equipment, etc. through floors, walls, ceiling and roofs, shall be located and sized by the Contractor under this division who shall provide and set necessary lintels, sleeves and sheet metal forms for all such openings.

I. Galvanized sheet metal collars shall be provided around all ducts, equipment, etc., exposed in finished areas. Where such openings and finished and the space around the penetration is small, the collar may be omitted with the approval of the Architect/Engineer.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 ESCUTCHEONS

A. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

3.5 CUTTING

A. All rectangular or special shaped openings in plaster, stucco or similar materials, including gypsum board, shall be framed by means of plaster frames, casing beads, wood or metal angle members as required. The intent of this requirement is to provide smooth even termination of wall, floor and ceiling finishes as well as to provide a fastening means for grilles, diffusers, lighting fixtures, etc.

B. All trades shall coordinate all openings in masonry walls with the General Contractor, and, unless otherwise indicated on the Architectural drawings, shall provide lintels for all openings required for the plumbing work (piping, wall boxes, etc.).

C. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the engineer.

D. Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.

E. Openings in metal building walls shall be made in strict accord with building suppliers recommendations.

3.6 PATCHING AND REPAIRING

A. Patching and repairing made necessary by work performed under this division shall be included as part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the engineer.

B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation or work of this Division, such items shall be repaired and/or replaced to the satisfaction of the engineer.

C. Where the installation or removal of piping, etc. requires or creates the penetration of fire or smoked rated walls, ceilings or floors, the space around such pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor or ceilings affected.

D. Piping passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe around which it is installed.

E. Where pipes pass through exterior walls, the wall openings shall be sealed air and water tight. This shall include sealing on both sides of the wall to insure air and water does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION 230517

SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and Equipment Hangers, Supports, and Associated Anchors

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provision for Mechanical Work

C. Section 230719 – HVAC Piping Insulation

D. Section 232113 - Hydronic Piping and Valves

1.3 REFERENCES

A. ANSI/ASME B31.1 - Power Piping

1.4 SCOPE

A. This specification shall apply for the design and fabrication of all hangers, supports, anchors, and guides. Where piping design is such that exceptions to this specification are necessary, the system shall be identified, and the exceptions approved by Engineer prior to installation. See drawings.

1.5 STRUCTURE

A. This section is intended to cover the structural requirements of the piping and equipment. It is not intended to imply that the building structure will support the loads imposed. The contractor shall review the structural drawings for where loads can be applied, what load can be supported, and what structural reinforcing is required. Specific questions can be directed to the structural engineer.

1.6 DESIGN

A. All supports and parts shall conform to the latest requirements of the ANSI Code for Pressure Piping B31.1.0, and MSS Standard Practice SP-58, SP-69 and SP-89 except as supplemented or modified by the requirements of this specification.

B. Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.

C. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.

D. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

E. Where possible, steel structural attachments shall be beam clamps. Other attachments shall be as scheduled.

F. All rigid hangers shall provide a means of vertical adjustment after erection.

G. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

H. Where horizontal piping movements are greater than ½ inch, or where the hanger load angularity from the vertical is greater than 4 degrees from the cold to hot position of the pipe, the hanger rod to structural attachment shall be by use of Anvil Fig. 47 and Fig. 299 or the hanger rod and structural attachments shall be offset in such manner that the rod is vertical in the hot position.

I. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.

J. Hangers shall be spaced in accordance with ANSI B31.1.0

K. Where practical, riser piping shall be supported independently of the connected horizontal piping.

1. Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with ANSI B31.1 codes.

L. Supports, guides, and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of support parts shall be based on a temperature gradient of 100 degrees F per inch distance from the outside surface of the pipe.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Anvil, Elcen, Mason Industries, Advanced Thermal, Fee & Mason, Piping Specialties, MIRO Industries.

2.2 SHIELDS

A. Shield for Insulated Piping 2 Inches and Smaller: galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support. See schedule for thickness.

B. Shield for Insulated Piping 2 ½ Inches and Larger: Pipe covering protective saddles.

C. Shields for Insulated Cold Water Piping 2 ½ Inches and Larger: Hard block non-conducting saddles in 90-degree segments, 12-inch minimum length, block thickness same as insulation thickness.

D. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.3 HANGER RODS

A. Threaded one end, threaded both ends, threaded continuously.

2.4 INSERTS

A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 PIPE HANGERS, SUPPORTS AND ANCHORS

A. BEAM CLAMPS

1. Beam clamps shall have malleable iron jaws, steel bolt or tie rod, nuts and jamb nuts.
2. C-clamps will not be permitted unless retainer is provided.

2.6 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

B. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping indicated in schedule on drawings.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Provide hangers with 1-1/2-inch minimum vertical adjustment.

E. Support riser piping independently of connected horizontal piping.

F. Support horizontal piping as follows:

Nominal Pipe Size	Single Rod Diameter	Thickness of Insulation Shield	Maximum Spacing Ferrous Piping	Copper Tubing	HDPE Piping
3/4" & Under	3/8"	16 gauge	6'	5'	2.5'
1"	3/8"	16 gauge	7'	6'	3'
1 1/4	3/8"	16 gauge	8'	8'	4'
1 ½"&2"	3/8"	16 gauge	9'	8'	4'
2 ½"&3"	½"	12 gauge	12'	8'	4'
4" & 5"	5/8"	12 gauge	14'	8'	4'
6"	3/4"	10 gauge	14'	8'	4'
8"	7/8"	8 gauge	14'	10'	5'

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Pipe Hangers	X	X						
Supports	X	X						
Inserts		X						

END OF SECTION 230529

SECTION 230530 – METAL FABRICATIONS AND STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide all miscellaneous metal and metal fabrications, complete, in place, as shown on the drawings, specified herein, or needed for a complete and proper installation and not specifically called for under other sections of these specifications.

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

1.3 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein.

B. Qualifications of personnel: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

C. Welding: Perform all shop and field welding required in connection with the work of this section, adhering strictly to the current pertinent recommendations of the American Welding Society.

1.4 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Metal surfaces, general: For fabrication of the work of this section which will be exposed to view, use only those materials which are smooth and free from surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness.

B. Standards: All materials shall comply with:

1. Steel plates, shapes, and bars: ASTM A36.
2. Steel plates to be bent or cold formed: ASTM A283, Grade C.
3. Steel tubing, hot-formed, welded, or seamless: ASTM A501.
4. Steel bars and bar-size shapes: ASTM A306, Grade 65, or ASTM A36.
5. Cold-finished steel bars: ASTM A108, grade as selected by the fabricator.
6. Cold-rolled carbon steel sheets: ASTM A336.
7. Galvanized carbon steel sheets: ASTM A526, with ASTM A525, G90 zinc coating.
8. Gray iron castings: ASTM A48, Class 30.
9. Non-shrink nonferrous grout: CE CRD C588.

2.2 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use and where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Standards: All fasteners shall comply with:

1. Bolts and nuts: Regular hexagon-head type, ASTM A307, Grade A.
2. Lag bolts: Square-head type, Fed. Spec. FF-B-561.
3. Machine screws: Cadmium plated steel.
4. Masonry anchorage devices: Expansion shields.

2.3 PAINT PRIMER

A. Standard primer: SSPC Paint System Guide No. 7.00.

2.4 FABRICATION

A. Workmanship

1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in the finished product.
2. Work to dimensions shown or accepted on the shop drawings, using proven details of fabrication and support.
3. Use type of materials shown or specified for the various components of the work.
4. Form exposed work true to line and level, with accurate angles and surfaces and with straight sharp edges.
5. Ease the exposed edges to a radius of approximately 1/32" unless otherwise shown.

6. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
7. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush; match and blend with adjoining surfaces.
8. Form exposed connections with hairline joints, flush and smooth.
9. Provide for anchorage of the type shown. Coordinate with supporting structure. Fabricate and space the anchoring devices to provide adequate support for intended use.
10. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

2.5 SHOP PAINTING

A. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise specified.

B. Remove scale, rust, and other deleterious materials before applying shop coat.

C. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

2.6 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware

1. Provide bent or otherwise custom fabricated bolts, plates, anchors hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete and other structures.
2. Manufacture or fabricate items of sizes, shapes, and dimensions required.
3. Provide malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere furnish steel washers.

B. Loose bearing and leveling plates:

1. Provide loose bearing and leveling plates for steel items bearing on concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.
2. Drill plates to receive anchor bolts and for grouting as required.

PART 3 - - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which miscellaneous metal items are to be installed, and correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Setting loose plates:

1. Clean concrete bearing surfaces free from bond- reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.
2. Set loose leveling and bearing plates on wedges, or other adjustable devices.
3. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shim; but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

B. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

C. Cutting, fitting, and placement:

1. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications.
2. Set work accurately in location, alignment, and elevation, and make plumb, level, true, and free from rack, measured from established lines and levels.
3. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar construction.
4. Fit exposed connections accurately together to form tight hairline joints.
5. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.
6. Grind exposed joints smooth, and touch up shop paint coat. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS code for procedures of manual shielded metal-arc welding, appearance and quality of weld made, and methods in correcting welding work.

E. Touch up painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 0.051 mm (2.0 mils).

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Metal Fabrication	X	X						

END OF SECTION 230530

SECTION 230548 – VIBRATION CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This specification includes vibration isolation, equipment balancing requirements and sound level criteria for equipment spaces and exterior mounted equipment.

B. Mechanical and electrical equipment and associated piping and ductwork shall be mounted on vibration isolators as specified and/or required to minimize transmission of vibration and structure-borne noise to building structure or spaces.

C. All rotating equipment shall be balanced both statically and dynamically. The equipment when mounted and placed in operation shall not exceed a self-excited vibration velocity of 0.10 inches per second in the vertical, horizontal or axial directions when measured with a vibration meter on the bearing caps or at the equipment mounting feet if the bearings are concealed.

D. All electrical motors shall comply with the balancing requirements of NEMA Standard HG-1-4.23.

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

1.3 SHOP DRAWINGS

A. Shop drawings shall be submitted as required in Section 230100: General Provisions for Mechanical Work. See Submittal Sheet.

B. Shop drawings for neoprene mounts, or pads and spring isolators with neoprene components shall contain a certification that the neoprene compound complies with the industry standards for physical properties.

C. All steel frames, steel bases and rails and vibration isolation units except those installed as part of the packaged equipment prior to shipment shall be furnished by one vibration isolation manufacturer.

D. All submittals for equipment bases and equipment and piping isolation shall be in one brochure. The isolation units including steel base for each piece of equipment and connected piping shall be grouped together. Each isolation unit in the group shall show the equipment location, weight supported, type unit specified, and type unit selected. Data for each spring isolator shall include outside diameter, deflection,

operating spring height, solid spring height and the ratio of outside diameter to the operating height. Submittal shall include detail drawings, cut sheets and catalog data showing foundations, bases, and isolators for all equipment. Certifications required for isolation materials shall be placed on all submittal drawings and catalog sheets containing neoprene items. The sound power levels in Db with reference to 10 - 12 watts, in the nine frequency bands between 31 and 8000 Hertz, exterior to the equipment as it effects the equipment space sound level shall be included with the data submitted for approval of the equipment. The sound power levels of the equipment with the resultant sound pressure levels for a room acoustics factor of 0.15 shall be plotted on an octave band analysis chart containing the broad band and pure tone Db sound pressure levels specified. When the equipment sound levels exceed the specification levels in any of the frequencies, the submittal shall include the sound attenuating enclosure or other method proposed to reduce the equipment sound level to that specified, with supporting data.

E. The submittals for equipment mounted at the exterior of the building, or generating outside noise, shall include sound level calculations showing equipment sound level limitations based on the requirements hereinbefore specified and applicable sound level ordinances. The equipment sound pressure levels in all nine frequency bands between 31 and 8000 Hertz shall be included in the data. Where required to comply with the sound level limitations, the sound attenuation method proposed, with supporting data, shall be included with the equipment submittal.

1.4 EQUIPMENT SOUND ATTENUATION

A. The sound pressure levels in occupied spaces generated by any mechanical and electrical equipment as transmitted by the building structure, supply or return duct borne, duct breakout or airborne through mechanical room wall and ceiling shall not exceed the following:

Octave Band Hertz							
Mid Frequency	63	125	250	500	1000	2000	4000
Sound Pressure Level dB	57	48	41	35	31	29	28

B. The maximum allowable sound pressure levels shall be reduced by 5 Db in any octave band where field tests indicate pure tone generation.

C. When equipment sound levels exceed the specified noise criteria removable acoustical enclosures, alterations to the equipment, or other approved means shall be provided to reduce the noise level to that specified. Ventilation openings in enclosures shall be provided with sound traps, access openings, observation ports and lights shall be provided where required for normal operation, observation and servicing.

D. Equipment sound power levels may be obtained by laboratory tests measured in accordance with ASHRAE Standard No. 35-36 or by field testing. All equipment sound power tests shall be certified for compliance with the specified test procedure and accuracy by the test personnel and a responsible official of the test company.

E. Mechanical equipment installed within or outside the building shall comply with all local, city, state and OSHA sound level requirements.

F. Test instruments shall be calibrated for accuracy by an approved testing laboratory or by the manufacturer. Certificates showing degree of accuracy shall be furnished to the Engineer.

G. All labor, instruments, and appliances required for the tests shall be furnished by the Contractor.

1.5 VIBRATION

A. Isolation system shall be stable during starting and stopping of equipment without excessive transverse or eccentric movement.

B. The installed vibration isolation system shall have a maximum lateral motion under start-up and shut-down conditions of 0.25 inch. Motions in excess shall be restrained by approved spring type mountings.

C. All electrical and piping connections shall be sufficiently flexible to permit proper isolation.

D. Isolation components shall be selected for the lowest operating speed of the equipment.

E. Isolators, including springs, exposed to weather shall be hot dip galvanized after fabrication.

F. Isolators shall be selected and located to produce uniform loading and deflection even when equipment weight is not evenly distributed.

G. The type of isolation, base, and minimum deflection shall be as required for each specific application when supported on a solid concrete slab, 6 inches total thick minimum. Vibration isolators with a deflection greater than the minimum specified shall be submitted for approval if they are needed to meet the noise criteria.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Mason Industries, Amber/Booth Company, Vibration Elimination Co., Inc.

2.2 ELASTOMERIC ISOLATORS

A. Elastomeric isolators shall be one of the following:

1. Neoprene isolation mounts of the straight-line deflection curve type. The isolation mounts shall be manufactured with bolt holes for bolting to equipment base. Bottom steel plates for mounting to subbase shall be provided where required to prevent movement of equipment. These isolators shall be molded in black oil-resistant neoprene and color coded. All metal parts shall be embedded in neoprene.

2. Neoprene pads shall be of cross-ribbed or waffle design, 5/16-inch minimum thickness. Where concentrated load bearing is encountered, steel bearing plates shall be bonded to the neoprene pads. The neoprene pads shall be sized for a load of 50 psi.

2.3 SPRING ISOLATORS

A. Spring isolators shall be free-standing, laterally stable without any housing and complete with 1/4-inch-thick neoprene acoustical friction pads between the base plate and the support.

B. All mountings shall have leveling bolts. Coil outside diameters shall be not less than 0.8 of the operating height.

C. Spring shall have an additional travel to solid equal to 50% of the operating deflection.

D. The horizontal stiffness of spring isolators shall be not less than 0.8 of the vertical (axial) stiffness.

E. Springs shall be designed and installed so that the ends remain parallel during and after deflection to operating height.

2.4 SUSPENSION TYPE ISOLATION

A. Suspension type spring isolation for piping system or equipment hangers shall be a combination of spring and neoprene in series. The spring and elastomer combination shall be encased in a structurally stable steel bracket. Spring diameters shall be large enough to permit a 15-degree angular misalignment of the rod without rubbing on the hanger box.

B. Suspension type elastomeric isolators shall be double deflection. Isolators shall be mounted in an open steel bracket with openings for hanger rod connections. The hanger rod shall be separated from contact with the hanger bracket by a neoprene grommet. The neoprene isolator shall have a minimum deflection of 0.35 inch.

C. Where required, pipe hangers shall be equipped with a method of holding the piping at a fixed elevation during installation and a secondary adjustment to transfer the load to the spring and maintain the same elevation. Deflection shall be clearly indicated by a permanent pointer and scale.

D. Duct isolation hangers shall consist of spring and neoprene grommet or mount encased in a steel bracket with suitable means of connecting to ducts and building structure.

2.5 FOUNDATIONS FOR MACHINERY

A. Subbases of 3500 PSI concrete not less than 4 inches high shall be provided for all floor and ground mounted mechanical equipment. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. A minimum clearance of 1

percent of the maximum base dimension or 1 inch shall be provided between subbases and all steel bases and steel saddles with equipment in operation.

B. Each electric motor shall be mounted on the same foundation as the driven machine.

C. Foundations for machines shall be a minimum of 2500 psi concrete with all exposed surfaces, steel troweled smooth and corners beveled.

D. Machines shall be secured to steel bases with anchor bolts of ample size. All machines having baseplates shall be grouted under the full area of the baseplate with a non-shrinking, premixed grout.

2.6 FLEXIBLE CONNECTIONS

A. Flexible hose shall be designed for an operating temperature of 50 degrees F above the maximum system design temperature and for a working pressure of not less than 125 psig or 150 percent of the system operating pressure whichever is greater.

B. Metal flexible hose shall be Grade E phosphor bronze, monel, or stainless steel corrugated tube covered with comparable bronze or stainless braid restraining and pressure cover. Stainless steel grade shall be 304. Live lengths of flexible metal hose shall generally be not less than recommended by the manufacturer for continuous vibration application.

2.7 VIBRATION ISOLATION ROOF CURB RAILS

A. Pre-fabricated factory assembled bases with neoprene or spring isolators. Unit shall be fully enclosed and air/water tight.

PART 3 - EXECUTION

A. Provide equipment and piping vibration isolation where required by equipment manufacturer and where called for on drawings.

B. Type of vibration isolators to be provided shall be based as follows:

1. Static deflection up to 1/4 inch - single deflection neoprene mounting or pads.
2. Static deflection 5/16 inch to 3/8 inch - double deflection neoprene mountings.
3. Static deflection above 3/8 inch - spring isolators.

C. Furnish vibration isolation for all piping connected to equipment mounted on vibration isolation. Equipment that has internally isolated units (compressors, etc.) shall be considered separately as to isolation requirements.

3.2 FLEXIBLE CONNECTIONS

A. Flexible connections shall be provided for all connections indicated on drawings, manufactured of materials suitable for the operating temperatures and pressures of the fluid or gas it is conveying.

B. Flexible hose shall be installed in accordance with the manufacturer's recommendations including placement in the pipe line without damage, misalignment or change in its normal length. Prior to filling the system, the alignment and length shall be checked by loosening the flange bolts to determine the installation conditions. The piping installation shall be corrected if necessary and the flexible hose replaced if damaged, at no cost to the Owner.

C. Equipment installed on the roof shall be mounted on pre-fabricated bases with neoprene or spring isolators. Where practical supports shall be at bearing walls or beam locations. Provide water-tight pitch pockets at roof level for all supports.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Elastomeric Isolators	X	X	X					
Suspension Type Isolators	X	X	X					
Spring Isolators	X	X	X					
Flexible Connections	X	X	X					
Vibration Isolation Curbs	X	X	X					

END OF SECTION 230548

SECTION 230553 – IDENTIFICATION OF HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Identification of products installed under Division 23 including:

1. Plastic Nameplates
2. Plastic Tags
3. Metal Tags
4. Stencils and Paint
5. Plastic Pipe Markers
6. Plastic Tape Pipe Markers
7. Underground Plastic Tape Pipe Markers

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

1.3 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Submit product data and manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seton

2.2 EQUIPMENT AND MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch square.

D. Metal Tags: Brass or aluminum with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

E. Stencils: With clean cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	**Length of Color Field**	**Size of Letters**
3/4" - 1-1/4”	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

1. Stencil Paint: Semi-gloss enamel black unless otherwise indicated.

F. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

G. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

H. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6-inch-wide by 4 mil thick, manufactured for direct burial service.

1. Underground plastic piping to be installed with a tracer wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials and to accept stencil painting.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.

B. Plastic or Metal Tags: Install with corrosive-resistant chain.

C. Stencil Painting: Apply in accordance with manufacturer's instructions.

D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

E. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.

F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

G. Equipment: Identify HVAC equipment such as but not limited to air handing equipment, condensing units, chillers, pumps, storage tanks, expansion tanks, water treatment devices etc. with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.

H. Controls: Identify control panels and major control components outside panels with plastic nameplates.

I. Valves: Identify valves in main and branch piping with tags.

J. Piping: Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Stenciled painting may be used on insulation. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

3.3 VALVES AND CHARTS

A. The Contractor under this Division shall attach a numbered brass tag to each valve installed under this Contract. Each number shall be prefixed with the “H" for hydronic valves. Tags shall be attached to the valves by means of brass "S" hooks. Tags shall be Seton Name Plate Co., C.H. Hanson Co. or Identifications.

B. A chart headed ""HYDRONIC VALVE CHART" shall be prepared. Three original charts shall be prepared and approved by the engineer. One of each approved type chart shall be framed under glass and mounted on the wall in the main mechanical room where directed. Three photocopies of each chart shall be made and shall be submitted through normal shop drawing channels for approval and subsequent owner's files. Each chart shall be formatted as shown below: (All normally closed valves shall have a brass tag marked Normally Closed.)

HYDRONIC VALVE CHART
PROJECT NAME
DATE

TAG NO.	VALVE LOCATION	VALVE TYPE/SIZE	VALVE FUNCTION

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Valve Chart	X							
Valve Tags	X	X						
Stencils		X						
Tape		X						
Pipe Markers		X						

END OF SECTION 230553

SECTION 230593 – TEST, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL SPECIFICATIONS

1.1 DESCRIPTION OF WORK

A. The total system balance shall be performed by an independent test and balance firm that specializes in testing and balancing of HVAC systems. It shall be the responsibility of the mechanical contractor to subcontract and coordinate this work.

B. This specialty firm shall perform the following:

1. On-going job site inspections of equipment, controls, and metering devices during construction to verify conformance with design specifications.
2. Air System Balance

    a. Outside Air Systems
    b. Supply Air Systems
    c. Return Air System

3. Hydronic System Balance

    a. Hot Water Hydronic Loop System

4. Control Systems Verification

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 – General Provisions for Mechanical Work

1.3 DEFINITIONS

A. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers.

B. HVAC: Heating, Ventilating and Air Conditioning.

C. NAS: National Account Services. An enhanced program of testing and balancing offering an expanded range of services including a Quality Assurance Guaranty.

D. TAB: Testing, Adjusting and Balancing of HVAC systems to meet design objectives and obtain optimum system performance.

E. TBE: Test and Balance Engineer is an individual certified by AABC or NEBB as having a degree in engineering and 3 years of test and balance experience, or, 5 years of

background in the air conditioning field and 5 years continuous field experience in testing and balancing work.

1.4 REFERENCES

A. 2011 ASHRAE Handbook, HVAC Applications, Chapter 38, Testing, Adjusting and Balancing.

1.5 AGENCY QUALIFICATIONS

A. Testing and Balancing (TAB) Agency shall be a member of the AABC or NEBB.

B. A certified Test-and-Balance Engineer (TBE) shall be responsible for certification of the total work of this section.

C. All work shall be performed in accordance with AABC National Standards. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.

1.6 QUALIFICATION SUBMITTALS

A. Testing and Balancing (TAB) Agency shall submit a company resume listing personnel and project experience in the field of air and hydronic system balancing.

B. TAB Agency shall furnish all necessary calibrated instrumentation to adequately perform the specified products. TAB Agency shall submit an inventory and calibration data of all instruments and devices in possession of the balancing agency, to enable the Owner, or his representative, to evaluate the balancing agency's performance capability.

C. The TAB Agency shall, upon acceptance of the contract, submit to the Owner, or the Owner's representative, a "Quality Assurance Guaranty".

D. Within 30 days after acceptance of the contract, the TAB Agency shall submit to the Design Engineer a working agenda which will include procedures for testing and balancing each type of air and water flow system. The Test and Balance Report format will also be submitted indicating data to be recorded.

1.7 NOTIFICATION AND SCHEDULING

A. A pre-balance conference shall be held prior to job start as scheduled by the Tab Agency. Attendees at the meeting shall include representatives of the Test and Balance (TAB) Agency, General Contractor, Mechanical Sub Contractor, Control Sub Contractor, Owner and Mechanical Engineer.

B. The schedule for testing and balancing the HVAC system shall be established by the General Contractor, and/or Owner’s representative, in coordination with the TAB Agency on a critical path network.

C. The TAB Agency is responsible for initiating this continuing coordinating to determine schedule for final testing and balancing services.

D. It will be necessary for the TAB Agency to perform its services in close coordination with the Mechanical Contractor, with all scheduling and deficiencies reported through the General Contractor, and/or Owner's representative.

E. Before testing and balancing commences, the TAB Agency shall receive notification in writing from the Mechanical Contractor that the system is operational, complete, and ready for balancing.

F. A completed system means more than just physical installation. The Mechanical Contractor shall certify that all prime movers; fans, pumps, refrigeration machines, boilers, etc., are installed in good working order, and that full load performance has been preliminarily tested.

G. The Mechanical Contractor shall certify in writing that all equipment has been checked, started and adjusted by the manufacturer and operated for the specified period.

1.8 COORDINATION WITH OTHER TRADES

A. To bring the HVAC system into a state or readiness for testing adjusting and balancing, the Mechanical Contractor shall perform the following:

1. Air Distribution Systems

a. Ensure that all splitters, extractors, volume, smoke and fire dampers are properly located and functional. Dampers serving requirements of smoke, minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
b. Verify that all supply, return, exhaust, and transfer grilles, registers, diffusers, and high-pressure terminal units are installed and operational.
c. Ensure that air handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc. are blanked and/or sealed to eliminate excessive bypass or leakage of air.
d. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
e. Make any necessary changes to the sheaves, belts, and dampers, as required by the TAB Agency, at no additional cost to Owner.
f. Install clean filters prior to testing.

2. Water Circulating Systems

a. Check all pumps to verify pump alignment and rotation.
b. Ensure that systems are clean, with the proper strainer screens installed for normal operation.
c. Check all pump motors for current and voltage, to ensure that motors do not exceed nameplate rating.
d. Provide overload protection of proper size and rating.

e. Ensure that all water circulating systems shall be clean, full, and free of air, that expansion tanks are set for proper water level, and that all air vents are installed at high points of systems and are operating.
f. Check and set operating temperature of heat exchangers to design requirements.

B. The Temperature Control Subcontractor Shall Perform the Following:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Calibrate room thermostats after installation and before the thermostat control verification tests are performed. The Test and Balance (TAB) Agency shall verify the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
4. The Control Contractor shall allow sufficient time in the project to provide assistance and instruction to the TAB Agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

C. The General Contractor and/or Owner's representative, Mechanical Contractor, Temperature Control Subcontractor, and the suppliers of the HVAC equipment shall all cooperate with the TAB Agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

D. In coordination with the General Contractor and/or Owner's representative, the TAB Agency shall arrange for an area of ample size and convenient location for storage of tools, equipment, and other items as required.

PART 2 - PRODUCTS - (Not applicable)

PART 3 - EXECUTION

3.1 ON-GOING JOB SITE INSPECTIONS

A. During construction, the balancing agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of 3 times. (Typically this is performed when 60% of the duct work is installed and again when 90% of the total system is installed and prior to insulation of the piping.)

B. The balancing agency shall submit a written report of each inspection to the Owner or owner's representative, and the contractors responsible for correcting noted deficiencies.

C. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.

D. Identify and evaluate any variations from system design.

E. Identify and report possible restrictions in systems (closed fire dampers, long runs of flexible duct, poorly designed duct fittings, etc.).

3.2 AIR SYSTEM TEST AND BALANCE PROCEDURES

A. Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.

B. Current and Voltage: Measure and record motor current and voltage.

C. Pitot Tube Traverse: Perform a Pitot tube traverse of main supply and return ducts to obtain total CFM. If a Pitot tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation of why a traverse was not made must appear on the appropriate data sheet.

D. Outside Air: Test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperature. Make allowances for heat of compression and motor heat where applicable.

E. Static Pressure: Test and record system static pressures, including suction and discharge static pressure profile of each fan.

F. Air Temperature: Take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on the entering and leaving side of each heating coil.

G. Zone Ducts (supply and return): Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.

H. Main Ducts: Adjust main ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

I. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

J. Tolerance - test and balance each diffuser, grille, and register to within 10 percent of design requirement.

K. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.

L. Description: Record the size and type of each diffuser, grille, and register on air outlet data sheets.

M. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

N. Exhaust Fans: Measure exhaust fan static pressure, total CFM, makeup air, and fan RPM. Measure motor operating voltage and amperage.

O. Measure exhaust fan static pressures, total CFM, makeup air, and fan RPM.

P. Measure motor operating voltage and amperage.

Q. Record the specified against the actual supplied horsepower and electrical characteristics of all motors.

3.3 HYDRONIC SYSTEM TEST AND BALANCE PROCEDURES

A. Water Treatment: Examine the water in the system to determine if the water has been treated and cleaned. If it has not, request that the mechanical contractor clean and treat the water.

B. Strainers: Ensure that mechanical contractor cleans all strainers.

C. Air Vents: Check all air vents at the high points of the water system and determine if they are installed and operating.

D. Valves: Set all balancing valves and automatic temperature control valves to the full open position for balancing.

E. Pumps: Adjust water pump to meet design GPM requirements. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Measure and record operating current and voltage.

F. Central Plant: Adjust water flow from the central plant if applicable.

G. Tolerances: Proceed to balance all chilled-water and hot water coils to within 10% of design requirements.

H. Marking: Mark all settings and record all data after completing the flow readings and coil adjustments.

I. Primary/Secondary Pumping System: If a primary-secondary pumping system is employed, the TAB Agency shall ensure that a proper balance is obtained between primary and secondary loops and that sufficient flow is always maintained in the secondary loop.

3.4 CONTROL SYSTEMS VERIFICATION

A. Verify that all control devices are properly connected.

B. Verify that all dampers, valves and other controlled devices are operated by the intended controller.

C. Verify that all dampers and valves are in the position indicated by the controller (open, closed or modulating).

D. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions. This includes dampers in multizone units.

E. Check that all valves are properly installed in the piping system in relation to direction of flow and location.

F. Check the calibration of all controllers.

G. Verify the proper application of all normally open and normally closed valves.

H. Check the location of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

I. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Control Contractor will relocate as deemed necessary by the TAB Agency.

J. Check the sequence of operation that any control mode is in accordance with approved shop drawings. Verify that only minimum simultaneous heating and cooling occurs.

K. Verify that all controller set points meet the design intent.

L. Check all dampers for free travel.

M. Verify the operation of all interlock systems.

N. Perform all system verification to assure the safety of the system and its components.

3.5 SYSTEM PERFORMANCE VERIFICATION

A. At the time of final inspection, the Test and Balance (TAB) Agency shall recheck, in the presence of the Owner's Representative, specific and random selections of data, air quantities, and air motion recorded in the Certified Report.

B. Points and areas for recheck shall be selected by the Owner's Representative.

C. Measurement and test procedures shall be the same as approved for work forming basis of Certified Report.

D. Selections for recheck, specific plus random, will not normally exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

E. If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Certified Report listings, by ten percent or more of the selected recheck stations, the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspection tests made, all at no additional cost to Owner.

F. Following system verification of the Certified Report by the Owner's Representative, the settings of all valves, splitters, dampers, and other adjustment devices shall be

permanently marked by the TAB Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.

G. Opposite Season Test

1. The Testing and Balancing (TAB) Agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The TAB Agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

3.6 RECORD AND REPORT DATA

A. The Test and Balance Report shall be complete with logs, data and records as required herein. All logs, data and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the Testing and Balancing (TAB) Agency's certified Test and Balance Engineer.

B. Copies of the Test and Balance Report are required and shall be submitted to the Owner, or the Owner's representative.

C. The report shall contain the following general data in a format selected by the TAB Agency.

1. Project number.
2. Contract number.
3. Project title.
4. Project location.
5. Project architect.
6. Project mechanical engineer.
7. Test and balance agency.
8. Test and Balance Engineer.
9. General contractor.
10. Mechanical subcontractor.
11. Date tests were performed.
12. Certification.

D. The Test and Balance Report shall be recorded on report forms conforming to the recommended forms in AABC National Standards. At a minimum, the report shall include:

1. Preface: A general discussion of the system, any abnormalities and problems encountered.
2. Instrumentation List: The list of instruments including type, model, manufacturer, serial number, and calibration dates.
3. Air Handling Equipment

a. Manufacturer, model number, and serial number.
b. All design and manufacturer related data.
c. Total actual CFM by traverse if practical, if not practical, the sum of the outlets may be used, or a combination of each of these procedures. For specific systems, such as ones with diversity, see the AABC National Standards.
d. Suction and discharge static pressure of each fan, as applicable.

e. Outside air and return air total CFM.
f. Actual operating current, voltage, and brake horsepower of each fan motor.
g. Final RPM of each fan.
h. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
i. Belt size and quantity.
j. Static pressure controls' final operating set points.

4. Pumps (Existing)

a. Manufacturer, size, and serial number.
b. All design and manufacturer's related data.
c. Pump operating suction and discharge pressure and final total dynamic head.
d. No flow (pump discharge valve closed) suction and discharge pressure and corresponding total dynamic head. This procedure is to determine actual impeller size.
e. Rated and actual operating current, voltage, and brake horsepower of each pump motor.
f. Submit pump curve showing design, operating, and no-flow points of operation.

5. Electric Heater

a. Manufacturer and model number.
b. All design and manufacturer rated data.
c. Actual operating current and voltage.

6. Hot Water Heater

a. Manufacturer and model number.
b. All design and manufacturer rated data.
c. Actual operating current and voltage.
d. Total GPM of hot water to unit, supply, and return.

END OF SECTION 230593

SECTION 230600 – MECHANICAL SYSTEMS DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training recordings.

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provision for Mechanical Work

1.3 SUBMITTALS

A. Instruction Program: Submit copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module

1. At completion of training, submit training manual for Owner's use which includes receipts signed by the Owner acknowledging that training took place.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Demonstration and Training Videos: Provide recording of all demonstrations and training given and submit video within ten days of end of each training module.

1. Identification: Provide an applied label with the following:

a. Name of Project
b. Name of Engineer
c. Name of Contractor
d. Date video was recorded
e. Description of information recorded.

2. Transcript: Prepared on 8-1/2-by 11-inch paper, punched and bound in heavy-duty, three ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as

the corresponding video recording. Include name of Project and date of video recording on each page.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with operation and maintenance manual information.

PART 2 - PRODUCTS

2.1 DEMONSTRATION AND TRAINING PROGRAM

A. Provide program that includes individual training modules for each system and equipment not a part of a system as required by individual Specification Sections and as follows, but not limited to:

1. HVAC: Provide demonstration and training by showing Owner personnel the major components of the HVAC system as follows:

a. Hydronic piping and valves
b. Electric Unit Heaters and location of each
c. Hot Water Unit Heaters and location of each
d. Packaged Air-Cooled Heat Pumps and location of each
e. Energy Recovery Units and location of each
f. Rooftop Units and location of each
g. Variable Refrigerant Flow System and location of each
h. Exhaust Fans and location of each
i. Mini-Split Units and location of each
j. Air Filter replacement instructions
k. Fire damper resetting instructions and location of each
l. Instrumentation and Controls overview

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner personnel to adjust, operate, and maintain systems, subsystems, and equipment not a part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

C. Schedule training with Owner, through Architect/Engineer, with at least ten days' advance notice.

3.3 DEMONSTRATION AND TRAINING RECORDINGS

A. Engage a qualified individual to record demonstration and training video(s). Record each training module separately. Include classroom instructions and demonstrations.

B. Format: Provide high-quality DVD or thumb drive. Cloud storage is unacceptable.

C. Narration: Describe scenes on video while recording. Include description of items being viewed.

D. Transcript: Provide typewritten transcript of the narration.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Instruction Program	X							
Attendance Record	X							
Demonstration and Training DVDs	X							

END OF SECTION 230600

SECTION 230719 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Piping Insulation

B. Jackets and Accessories

1.2 RELATED WORK

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

C. Section 230553 - Identification of HVAC Piping And Equipment

1.3 QUALITY ASSURANCE

A. Materials: Flame spread smoke developed rating of 25/50 in accordance with ASTM E84.

B. All pipe insulation shall be installed by mechanics specializing in this type of work. The finished product shall present a neat and workmanlike appearance. Insulation shall not be applied until all tests except operating tests have been completed, all foreign material, such as rust, scale, or dirt, has been removed and the surfaces are clean and dry. Insulation shall be clean and dry when installed and during the application of any finish.

C. The insulation, insulating materials and related items shall be delivered to the jobsite in the manufacturer's unopened containers. The containers shall have labels stating the manufacturer's name, contents, quantity and other pertinent data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulations having the thermal and physical properties of the specific materials specified hereinafter, of any of the following manufacturers, or approved equal, are acceptable.

1. Armstrong
2. Certain Teed/Saint Gobain
3. Johns Mansville
4. Knauf

5. Owens Corning
6. Pittsburgh Corning
7. Rubatex

B. The Engineer reserves the right to determine if the proposed insulating materials of any one manufacturer are acceptable in lieu of the specific insulation selected for the following applications.

2.2 INSULATION

A. Type A glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.23 minimum at 75 degrees F; noncombustible.

B. Type B cellular foam; flexible, plastic; 'k' value of 0.25 minimum at 75 degrees F; ASTM C534. APArmaflex W (white) or APArmaflex SS (black) or equal.

2.3 JACKETS

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets: One piece, premolded type.

C. Canvas Jackets: UL listed treated cotton fabric, 6 oz/sq. yd.

2.4 ACCESSORIES

A. Insulation Bands: 3/4-inch-wide; 0.015-inch-thick galvanized steel, stainless steel. 0.007-inch 0.18 thick aluminum.

B. Metal Jacket Bands: 3/8-inch-wide; 0.015-inch-thick aluminum. 0.010-inch-thick stainless steel.

C. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.

D. Finishing Cement: ASTM C449.

E. Fibrous Glass Cloth: Untreaded; 9 oz/sq. yd weight.

F. Adhesives: Compatible with insulation.

G. Treated wooden blocks.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping has been tested and approved.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Continue insulation with vapor barrier through penetrations, except on fire rated walls.

C. In exposed piping, locate insulation and cover seams in least visible locations.

D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used. Insert shall extend around bottom 120 degrees of pipe barrel and shall be included inside vapor barrier jacket where applied. See Section 230529 for shields and hangers.

F. Neatly finish insulation at supports, protrusions, and interruptions.

G. Jackets

1. Indoor, Concealed Applications: Insulated pipes shall have standard jackets, with vapor barrier, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used.
2. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications. Finish with canvas jacket; size for finish painting. This jacketing must be properly applied with lagging adhesive, such that the outer surface is smooth and free of wrinkles. Do not use PVC jackets. All chilled water piping insulation shall be completely sealed so that a perfect vapor barrier is achieved.
3. Indoor, Field-Applied Jacket Schedule: Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Piping jacket shall be Stainless Steel, Type 304 or Type 316, Smooth 2B Finish: 0.020 inch thick.
4. Outdoor, Field-Applied Jacket Schedule: Install jacketing on all piping to be installed outside the building per the following: foil faced, UV-resistant vapor barrier and weather barrier membrane, self-stick, self-healing, with a zero-perm rating; for use on exterior duct, piping, and vessels. Jacketing shall be a high strength foil/polymer laminate coated with self-healing, self-adhering rubberized asphalt. Jacketing shall not require ‘slip joints’ and shall expand and contract with the system without rupture or leakage. Jacketing shall be for use as UV protection, weather protection, vapor barrier, and mechanical protection; and simple ‘peel and stick’ installation.
5. Flanges, Valves, Anchors, and Fittings: Unless otherwise specified, all flanges, valves, anchors and fittings shall be insulated with factory premolded or field fabricated segments of insulation of the same materials and thickness as the adjoining pipe insulation. When segments of insulation are used, elbows shall be provided with not less than three segments. For other fittings and valves, segments shall be cut to required curvatures, or nesting size sectional insulation shall be used. The segments of the insulation shall be properly placed and jointed with fire-resistant adhesive. After the insulation segments are firmly in place, fire-resistant vapor barrier coating shall be applied over the insulation in two coats

with glass tape embedded between coats. The coating shall be applied to a total dry film thickness of 1/16 inch minimum. All glass tape seams shall be terminated neatly at the ends of the unions with insulating cement troweled on the bevel. For piping operating below ambient temperature, the beveled ends shall receive a coat of vapor barrier coating. Where anchors are used and secured directly to low temperature piping, they shall be insulated for a distance to prevent condensation, but not less than 6 inches from the surface of the pipe insulation. For jacket facing to receive finish painting, the factory applied jacket shall be as specified herein, except that the kraft paper shall be light colored with the kraft paper exposed. Field applied vapor barrier jacket shall conform to the above conditions where finish painting is required.

INSULATION APPLICATION AND THICKNESS (inches)							
Pipe System	**Type**	**Range °F**	**Pipe Diameter Range (inches)**				
			<1	**1 – 1.5**	**1.5 – 4**	**4 - <8**	**≥8**
			Insulation Thickness (inches)				
Condensate Drain	B		0.5	0.5	0.5	0.5	0.5
Refrigerant	B		0.5	1.0	1.0	1.0	1.0
Heating Hot Water	A/B	120-200	1.5	1.5	2.0	2.0	2.0

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Valve Chart	X							
Valve Tags	X	X						
Stencils		X						
Tape		X						
Piping Insulation	X	X						

END OF SECTION 230719

SECTION 230800 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The purpose of this Section is to define Contractor responsibilities in the commissioning process, which are being directed by the Commissioning Authority. **The Commissioning Authority is being secured under separate contract.**

B. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents.

C. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

D. Related Sections:

1. Section 019113 "General Commissioning Requirements" for general commissioning process requirements.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.6 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.7 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 Testing AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing provider 10 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing provider shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R Subcontractor, testing and balancing provider, and HVAC&R Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 HVAC&R systems, subsystems, and equipment Testing Procedures

A. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Section 230900 "Direct Digital Control (DDC) System for HVAC". Assist the CxA with preparation of testing plans.

B. Energy Supply System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of gas, hot-water, and chilled water systems and equipment at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

C. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, refrigerant compressors and condensers,

and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

D. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

E. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

F. HVAC Systems:

1. Roof Top Unit with Economizer
2. Infrared Radiant Heaters
3. Split System Air Conditioning Systems with Natural Gas Furnace
4. Exhaust Fans
5. Unit Heaters
6. Mini-split Air Conditioning Systems

END OF SECTION 230800

SECTION 230900 – INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide an extension of the existing Building Automation System (BAS) to control all mechanical equipment associated with this project. All new building controllers, and equipment/plant controllers, shall be tied into the Owner's existing Trane Tracer Ensemble for seamless user interface.

1. The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to tie all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.
2. The BAS shall meet open standard protocol communication standards (As defined in System Communications and Field Bus Communications of COMMUNICATIONS) to ensure the system maintains "interoperability" to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects.
3. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.
4. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

1.2 APPROVED CONTROL SYSTEM CONTRACTORS

A. The BAS system shall be designed, installed, commissioned, and serviced by factory trained personnel. New controls provided by Vendor shall be tied into Owner's existing Trane Ensemble System for seamless user interface. Hotlinks/Targets to other applications and/or separate web pages will NOT be accepted as a seamless interface to the Trane Ensemble System.

1. Trane Tracer – Basis of Design, or equal.

1.3 SYSTEM COMMUNICATION

A. System Communications

1. Each workstation, building controller, and equipment controller communication interface shall utilize the BACnet protocol with an Ethernet (IEEE 802.3, 802.11), RS485 (EIA-485), or Zigbee (802.15.4) physical interface and an appropriate data link technology as defined in ANSI®/ASHRAE® Standard 135-2012. (e.g., BACnet over IP, BACnet over IPv6, BACnet over MS/TP, BACnet Zigbee).
2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI®/ASHRAE® Standard 135-2012.
3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI®/ASHRAE® Standard 135-2012.
4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.

B. Field Bus Communications

1. BACnet

a. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.
b. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.
c. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.
d. BACnet over Zigbee

1) Communication between System Controller and equipment/plant controllers shall utilize BACnet over Zigbee as defined in ANSI®/ASHRAE® Standard 1352012.
2) Each equipment controller wireless communication interface shall self-heal to maintain operation in the event of network communication failure.
3) Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO2, and occupancy.

e. BACnet over MS/TP

1) Communication between System Controller and equipment/plant controllers shall utilize BACnet over MS/TP as defined in ANSI®/ASHRAE® Standard 1352012.

1.4 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - GENERAL PROVISION FOR MECHANICAL WORK

1.5 QUALITY ASSURANCE

A. Installer Qualifications: The installer shall have an established working relationship with the Control System Manufacturer of not less than three years and be trained and approved by the Control System Manufacturer for installation of system components required for this Project.

PART 2 - PRODUCTS

2.1 TEMPERATURE SENSORS

A. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.

B. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 5 feet in length.

C. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.

D. Space temperature sensors in all classrooms and administration offices shall be surface mounted and equipped with a warmer-cooler knob or slide, override switch, digital room temperature display, and communication port.

E. Space temperature sensors in the commons, gymnasium, library, multipurpose room, corridors, lobby, and entryways, shall sense the room temperature, have a digital room temperature display, and have a communication port. The sensors in these locations shall not be equipped with a warmer-cooler knob or slide, or override switch.

F. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.2 F.

2.2 TEMPERATURE INDICATORS

A. Five-inch diameter, industrial dial type thermometers shall be installed at the locations shown on the drawings. Stem length shall be appropriate for pipe size with at least 2 inches of immersion where possible in liquids. The thermometers shall be as manufactured by Ametek, Ashcroft, Trevice or Weiss.

B. Water supplies and returns range (Degrees F) shall be 20 - 120.

C. Provide brass separable well or insertion tap on inlet and outlet of each item requiring water.

2.3 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. Each DDC Controller shall be able to extend its performance and capacity using remote application specific controllers (ASCs) through LAN Device Networks. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a

microprocessor-based, multi-tasking, real-time digital control processor. Provide the following types of ASCs as a minimum as applicable to this project:

1. Rooftop Unit Controllers
2. Heat Pump Unit Controllers
3. Exhaust Fan Controllers
4. Domestic Water Pump Controllers
5. Infrared Heaters Controllers

B. Each ASC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.

1. Each controller shall support its own real-time operating system. Provide a time clock with battery backup to allow for stand-alone operation in the event communication is lost and to insure protection during power outages.
2. Programming of central system controllers shall utilize the same language and code as used by DDC Controllers to maximize system flexibility and ease of use. Should the system controller utilize a different control language, provide a DDC Controller to meet the specified functionality.
3. Each controller shall have connection provisions for a portable operator's terminal. This tool shall allow the user to display, generate or modify all point databases and operating programs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.2 GENERAL WORKMANSHIP

A. Install equipment, piping, wiring/conduit parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible location as defined by chapter 1 article 100-part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.3 WIRING

A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these specifications. Where the requirements of this section differ with those in Division 26, the requirements of this section shall take precedence.

B. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that:

1. Circuits meet NEC Class 2 (current-limited) requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)
2. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.

C. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

D. Where class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 10 ft intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 5 ft intervals or more often to achieve a neat and workmanlike result.

E. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

F. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.

G. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.

H. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.

I. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.

J. Control and status relays are to be in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.

K. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.

L. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

M. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

N. Control wiring shall not be run in building s data cable tray.

3.4 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequate for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.

E. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.

F. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.

G. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

H. Furnish and install at all thermostat and sensor locations shown on the Mechanical Drawings, 1 or 2 gang boxes as required at 48" AFF with blank stainless-steel plates for field mounting of thermostats and sensors. Extend wiring in 3/4" conduit from box to a point above finished ceiling. Extension of conduit system and installation of control conductors shall be provided by the temperature control contractor.

3.5 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.

D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.6 CONTROLLERS

A. Provide a separate Controller for each major piece of HVAC equipment. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.

B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.

C. Future use of spare capacity shall require providing the field device, field wiring, points database definition, and custom software. No additional Controller boards or point modules shall be required to implement use of these spare points.

3.7 TRAINING AND SYSTEM EVALUATION

A. Provide a minimum of four system hands on training sessions (quarterly), 8 hours each during the contract period for personnel designated by the Owner.

B. The BAS operator training and instructional program will be initiated to ensure that the owner/operators are instructed and trained on the many functions of their building management system. The building owner/operator will be taught to perform the following functions by factory trained, authorized building automation service representatives. The building operators will learn how to perform daily operations including:

1. An overview of the building management system architecture and unit level controllers.
2. System logon/logoff procedures
3. Access system using menus and graphics
4. Respond to alarms
5. Make schedule changes
6. Monitor and command objects and properties
7. How to utilize and set up trends
8. Generate and save reports
9. Verification that the specified equipment sequences of operation and building control strategies are maintained intact.

C. This program will be performed on quarterly intervals with the building operators throughout the first year of system operation.

PART 4 - SEQUENCE OF OPERATION

A. Refer to M-700 sheets for Sequence of Operation information and DDC Network Communications Diagram.

PART 5 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Temperature Controls	X	X	X	X	x	X		

END OF SECTION 230900

SECTION 232113 – HYDRONIC PIPING AND VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and pipe fittings

B. Valves

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - General Provision for Mechanical Work

C. Section 232113 – Hydronic Piping & Valves

1.3 WELDING AND BRAZING

A. Welders Qualification

1. Welder's qualifications shall specify results of test, or retest, positions qualified and type of welding in which qualified.
2. All welds shall be of sound metal thoroughly fused to the base metal at all points, free from cracks; and reasonably free from oxidation, blow holes, and non- metallic inclusions. No fins or weld metal shall project within the pipe; and should they occur shall be removed. All pipe beveling shall be done by machine. The surface of all parts to be welded shall be thoroughly cleaned free from paint, oil, rust, or scale, at the time of welding except that a light coat of oil may be used to preserve the beveled surfaces from rust.
3. All pipe and fittings shall be carefully aligned with adjacent parts and this alignment must be preserved in a rigid manner during the process of welding.
4. It is required that all welding of piping covered by this specification, regardless of conditions of service, be installed as follows:

    a. Pipe welding shall comply with the provision of the latest revisions of the applicable code whether ASME "Boiler Construction Code", ANSI "Code for Pressure Piping".
    b. The Contractor's welding procedure shall clearly set forth P-numbers of parent metal to be welded, rod or filter metal to be used and positions required.
    c. Before any pipe welding is performed, the Contractor shall submit to the Architect a copy of his welding procedure specifications together with proof of its qualification as outlined and required by the most recent issue of the code having jurisdiction.

d. Before any operator shall perform any pipe welding, the Contractor shall also submit to the Architect, the operator's qualification record in conformance with provisions of the Code having jurisdiction, showing that the operator was tested under the approved procedure specification submitted by the Contractor.
e. Welding work shall not be performed by welders who are not approved by the Architect and any such work performed shall be summarily removed and replaced without further recourse by the Contractor.
f. Standard Procedure Specifications and operators qualified by the National Certified Pipe Welding Bureau shall be considered as conforming to the requirements of the specifications.
g. Each manufacturer or Contractor shall be responsible for the quality of welding done by his organization and shall repair any work not in accordance with these specifications.
h. Brazing, when specified or indicated on the contract drawings, shall be in accordance with Part UB of Section VIII of the ASME Code. Filler metal shall conform to AWS B260, Class B AG-1 or B AG-2. Procedure and performance qualification requirements for brazing shall be the same as for welding, as required above.

1.4 PROTECTIVE COATINGS FOR PIPE AND FITTINGS

A. Protective Coating for Pipe and Fittings: Metallic pipe and fittings, except cast iron and copper, that are installed underground shall be provided with a field- or shop-applied coal-tar coating and wrapping or a shop-applied extruded polyethylene sheath. The coating shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a second coat of coal-tar enamel, a second wrapper of coal-tar saturated felt, and a wrapper of Kraft paper applied in the order named and conforming to the requirements of AWWA Standard C203 for materials, thicknesses, methods of application, tests, and handling, except that interior lining will not be required. Upon completion of satisfactory tests hereinafter specified, the joints shall be hand-wrapped with hot-applied preformed coal-tar tape. Preparation of surface and hand-applied wrapping shall be done in such a manner that a covering equal in effectiveness to that of the shop-applied coating will be produced. When extruded polyethylene sheath is used for the protective coating, fittings and joints shall be covered in the manner and with the materials recommended by the manufacturer of the sheath.

PART 2 - PRODUCTS

2.1 HOT WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, A106 or A120, Schedule 40, black.

1. Fittings: ANSI/ASTM B16.3, malleable iron, or ASTM A234, forged steel welding type fittings, or grooved mechanical fittings.
2. Joints: Screwed for pipes up to 2 inch, or ANSI/AWS D1.1, welded for pipes over 2 inch, or grooved mechanical couplings.

B. Copper Tubing: ASTM B75, B88 OR B251, Type L, hard drawn.

1. Fittings: ANSI/ASME B16.23 cast brass or ANSI/ASME B16.29 wrought copper or grooved mechanical fittings.
2. Joints: ASTM B32, solder, Grade 95TA, or grooved mechanical couplings.

2.2 EQUIPMENT DRAINS, CONDENSATE DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53 or A120, Schedule 40 galvanized.

1. Fittings: Galvanized cast iron, or ANSI/ASTM B16.3 malleable iron.
2. Joints: Screwed or grooved mechanical couplings.

B. Stainless Steel Pipe: ASTM A312, Type 304/304L, full finish annealed pipe, certified for use with Vic Press 304™ joints.

1. Fittings: Precision cold drawn austenitic stainless steel, Type 304/304L, complete with synthetic rubber grade EPDM O-rings.
2. Joints: Vic Press 304™.

C. Copper Tubing: ASTM B88, Type L, M or DWV hard drawn.

1. Fittings: ANSI/ASME B16.18 bronze sand castings, ANSI B16.22 wrought copper, ANSI/ASME B16.23 cast brass, or ANSI/ASME B16.29 solder wrought copper.
2. Grooved joint fittings, as manufactured by Victaulic, or equal, shall be manufactured to copper tubing sizes, with grooved ends designed to accept grooved end couplings of the same manufacturer. Flaring of tube and fitting ends to IPS dimensions is not allowed.
3. Joints: ASTM B32, solder, Grade 95TA or grooved joints with EPDM gaskets.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; 300 psig stainless steel, threaded type with Vic Press 304™ ends for stainless steel pipe; bronze unions for copper pipe, soldered joints.

B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; 1/16-inch-thick preformed neoprene bonded to asbestos.

C. Grooved and Shouldered Pipe End Couplings: Ductile iron housing clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion, where required; C-shape elastomer composition sealing gasket for operating temperature range from -30 degrees F to 250 degrees F; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.

1. IPS Steel Piping:

a. Rigid Type: Couplings housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style 107H, GruvLok Figure 7402.

b. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Style 177, GruvLok Figure 7001.
c. Flange Adapter: Flat face, for direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 741, GruvLok Figure 7012, or Figure 7788.

2. Hard Copper Tube: Housings cast with offsetting, angle-pattern bolt pads. Housings coated with copper colored alkyd enamel. Manufactured to copper tube dimensions, with Grade "EHP" EPDM QuickVic type gasket or equal with a maximum temperature rating of 250 deg F. Victaulic Style 607 QuickVic, GruvLok Figure 6402.
3. High Density Polyethylene Pipe

a. Victaulic Refuse-To-Fuse system rated for SDR 7-17 piping systems may be utilized. Victaulic style 905 couplings for 2"-6" and style 908 couplings for 8" and larger in conjunction with Victaulic HDPE fittings.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder joint, plain or weld-neck and connections that match piping system materials.

2.5 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brags, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

2.6 PROTECTIVE COATING FOR PIPE AND FITTINGS

A. Protective Coating for Pipe and Fittings: Metallic pipe and fittings, except cast iron and copper, that are installed underground shall be provided with a field- or shop-applied coal-tar coating and wrapping or a shop-applied extruded polyethylene sheath. The coating shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a second coat of coal-tar enamel, a second wrapper of coal-tar saturated felt, and a wrapper of Kraft paper applied in the order named and conforming to the requirements of AWWA Standard C203 for materials, thicknesses, methods of application, tests, and handling, except that interior lining will not be required. Upon completion of satisfactory tests hereinafter specified, the joints shall be hand-wrapped with hot-applied preformed coal-tar tape. Preparation of surface and hand-applied wrapping shall be done in such a manner that a covering equal in effectiveness to that of the shop-applied coating will be produced. When extruded polyethylene sheath is used for the protective coating, fittings and joints shall be covered in the manner and with the materials recommended by the manufacturer of the sheath.

2.7 GATE VALVES

A. Up to 2 Inches: Class 125, ASTM B-62 bronze body, bronze trim, rising stem, handwheel, screwed bonnet, ASTM B-62 bronze solid wedge disc, solder, or threaded ends.

B. Over 2 Inches: Class 125, ASTM A-126 iron body, bronze trim, rising stem, handwheel, bolted bonnet, OS & Y, solid wedge disc, flanged or grooved ends.

C. Manufactured by Crane, Nibco, Stockham, or Watts.

2.8 GLOBE VALVES

A. Up to 2 Inches: Class 125, ASTM B-62 bronze body, bronze trim, rising stem, handwheel, screwed bonnet, renewable composition disc, solder, or screwed ends, with back seating capacity.

B. Over 2 Inches: Class 125, ASTM B-62 iron body, bronze trim, rising stem, handwheel, bolted bonnet, OS & Y, plug-type disc, flanged ends, renewable bronze seat and disc.

C. Manufactured by Crane, Nibco, Stockham, or Watts.

2.9 BALL VALVES

A. Up to 2 Inches:

1. 150 psig WSP/600 psig WOG, conventional port bronze two-piece body, hard chrome plated forged brass ball, Teflon seats and stuffing box ring, lever handle, adjustable stem packing nut, blow-out proof stem, solder, or threaded ends.
2. Forged brass two-piece body, chrome plated brass ball and stem, Teflon seats, lever handle, Vic Press 304™ ends, 300 PSIG CWP, Victaulic Series 589.
3. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic, or Watts.

B. Over 2 Inches:

1. 200 psig CWP, cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle.
2. 300 psig CWP, ductile iron body, chrome plated carbon steel ball and stem, Teflon seat, lever handle.
3. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic, or Watts.

C. Ball valves shall have extended stem assembly to clear thickness of pipe insulation.

2.10 PLUG COCKS

A. Up to 2 Inches: 175 psig WOG, semi-steel, lubricated, Teflon packing, threaded ends, with one wrench operator for every ten plug cocks.

B. Over 2 Inches: 175 psig WOG, semi-steel body and plug, pressure lubricated, Teflon packing, flanged ends, with wrench operator with set screw.

C. Manufactured by Nordstrom, Powell, or Walworth.

2.11 BUTTERFLY VALVES

A. 125 psig WOG, iron body, bronze disc, resilient replaceable EPDM seat for service to 180 degrees F, wafer or lug ends, extended neck, 100 percent shut off lever with memory stop.

B. Ductile iron body, offset electroless nickel plated ductile iron disc, pressure responsive seat, Type 416 stainless steel stem and TFE lined fiberglass bearings. Victaulic Vic®-300 MasterSeal™.

C. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic, or Watts.

2.12 SWING CHECK VALVES

A. Up to 2 inches: Class 125, ASTM B-62 bronze body, threaded cap, horizontal swing type, ASTM B-62 bronze disc, threaded or soldered ends.

B. Over 2 inches: Class 125 iron body, bronze mounted trim, horizontal swing type, flanged ends.

C. 2 inches to 4 inches: 300 psig CWP, ductile iron body, type 316 stainless steel clapper, horizontal swing type with grooved ends. Victaulic Series 712 or equal.

D. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic or Watts.

2.13 SPRING LOADED WAFER CHECK VALVES

A. Over 2 inches: Class 125, ASTM A-126, cast iron body, stainless steel spring, ASTM B-62 bronze disc, Buna-N seal.

B. 2 inches to 3 inches: 365 psig CWP, ductile iron body, stainless steel disc and spring, brass shaft, plated nickel seat, grooved ends. Victaulic Series 716H or equal.

C. 4 inches to 12 inches: 300 psig CWP, ductile iron body, synthetic rubber coated ductile iron disc, stainless steel spring, brass shaft, welded-in nickel seat, grooved ends. Victaulic Series 716 and Series 779 or equal.

D. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic or Watts.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges, couplings, or unions.

D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

A. Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, properly clearing all windows, doors, and other openings.

B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

C. Ferrous piping and copper piping shall be electrically isolated from each other with dielectric couplings or fittings.

D. Do not use bull-headed tee fittings.

E. Install piping to conserve building space, and not interfere with use of space and other work. Do not change the designed path of piping, add excessive turns or offsets, or change pipe sizes without first consulting the Engineer.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance for installation of insulation, and access to valves and fittings.

I. Provide access where valves and fittings are not exposed.

J. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Section Painting.

M. Install valves with stems upright or horizontal, not inverted.

N. Vic Press 304™ Joints: Pipe shall be certified for use with the Vic Press 304™ system. Pipe shall be square cut, +/- 0.030”, properly deburred and cleaned. Pipe ends shall be marked at the required location, using a manufacturer-supplied gauge, to ensure full insertion into the coupling or fitting during assembly. Use a Victaulic ‘PFT’ series tool with the proper sized jaw for pressing.

O. Grooved joint piping systems shall be installed in accordance with the manufacturer’s guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified.

Grooved end shall be clean and free of indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. A factory trained field representative shall provide on-site training to contractor's field personnel in the proper use of grooving tools and the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

P. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

3.3 APPLICATION

A. Use grooved mechanical couplings and fasteners in accessible locations or where approved by the engineer.

B. Install unions or grooved joint couplings downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe or ball valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of condenser water pumps.

G. Use plug cocks for throttling service.

H. Use only butterfly valves in heat pump and cooling tower water systems interchangeably with gate and globe valves.

I. Use only butterfly valves in condenser water systems for throttling and isolation service.

J. Use lug or grooved end butterfly valves to isolate equipment.

K. Provide 3/4-inch gate or ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.

L. Provide automatic air vents, piped per details on drawings, at all high points of piping and at end of hydronic supply mains.

M. Do not install above grade piping in areas subject to freezing. When such an area is encountered, notify the engineer for further instructions.

3.4 TESTS

A. Piping: After cleaning, all piping shall be hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure but not less than 100 psi for a period sufficient to inspect every joint in the system and in no case less than 2 hours. No loss of pressure will be allowed. Leaks found during tests shall be repaired by re-welding or replacing pipe or fittings. Caulking or peening of joints or fittings will not be permitted. Concealed and insulated piping shall be tested in place before covering or concealing.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Pipe	X	X						
Fittings	X	X						
Valves	X	X	X					
Welders Certificate						X		

END OF SECTION 232113

SECTION 232300 – REFRIGERANT PIPING & VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and pipe fittings

B. Valves

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

C. Section 230719 – HVAC Piping Insulation

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, “Welding and Brazing Qualification.”

B. Comply with ASHRAE 15, “Safety Code for Refrigerant Systems.”

C. Comply with ASME B31.5, “Refrigerant Piping and Heat Transfer Components.”

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L or ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

D. Brazing Filler Metals: AWS A5.8.

2.2 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction, Hot-Gas and Liquid Lines: Copper, Type ACR or L or K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

2.3 VALVES AND SPECIALTIES

A. All valves and specialties to be rated for a working pressure of 500 psig and a maximum operating temperature of 240 deg F.

B. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.

C. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.

D. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. Maximum Opening Pressure: 0.50 psig.

E. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.

F. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

G. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

H. Thermostatic Expansion Valves: Comply with ARI 750.

I. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

J. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.

2. Screen: 100-mesh stainless steel.

K. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.

L. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.

M. Replaceable-Core Filter Dryers: Comply with ARI 730.

N. Permanent Filter Dryers: Comply with ARI 730.

PART 3 - - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as required if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs where required.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Seal penetrations through fire and smoke barriers.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

T. Seal pipe penetrations through exterior walls.

3.2 PIPE JOINT CONSTRUCTION (per manufacturer)

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Refrigerant Piping & Valves	X	X	X	X				

END OF SECTION 232300

SECTION 233113 – DUCTWORK AND DUCTWORK INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Low Pressure Ducts

B. Insulation

C. Duct Cleaning

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

C. Section 233300 – Ductwork Accessories

1.3 REFERENCES

A. ASHRAE - Handbook 2013 Fundamentals; Chapter 21- Duct Design.

B. ASHRAE - Handbook 1989 HVAC Systems and Equipment; Chapter 19 - Duct Construction.

C. ASHRAE - Surface Burning Characteristics of Building Materials.

D. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

E. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

F. NFPA 96 - Installation of Equipment for the removal of Smoke and Grease- Laden Vapors from Commercial Cooling Equipment.

G. IMC - International Mechanical Code - Latest Issue

H. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

I. UL 181 - Factory-made Air Ducts and Connections.

1.4 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Low Pressure: Three pressure classifications: 2-inch WG positive or negative static pressure and velocities less than 2, 000 fpm; 1-inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2-inch WG positive or negative static pressure and velocities less than 2,500 fpm.

C. Medium Pressure: Three pressure classifications: 3-inch WG positive or negative static pressure and velocities less than 4,000 fpm, 4-inch WG positive static pressure and velocities greater than 2,000 fpm, 6-inch WG positive static pressure and velocities grater thank 2,000 fpm and

D. High Pressure: 10-inch WG positive static pressure and velocities greater than 2,000 fpm.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. C&R Sheet Metal, Ductmate, DuctSox Corporation, Eastern Sheet Metal, Euro-Aire, Fabricair, FlexmasterUSA, KE Fibertec, Lindab, Nordfab, Turnkey or Hamlin.

2.2 MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

B. All duct material and covering shall have a flame spread rating of 24 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84.

C. Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock forming quality, having zinc coating of 1.25 oz. Per sq. ft. for each side in conformance with ASTM G90.

D. Flexible Ducts: Interlocking spiral of galvanized steel, or fabric supported on helically wound spring steel wire rated to 2 inches WG positive and 1.5 inches WG negative for low pressure ducts and 15 inches positive or negative for medium high-pressure ducts. Flexible ducts shall conform to UL 181. Maximum length per run shall be 48".

E. Insulated Flexible Duct: Flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F. Maximum length per run shall be 48".

F. Stainless Steel Ducts: ASTM A480/A480M, Type 304.

G. Double-Wall Duct and Fittings

1. Outer Duct to conform with SMACNA Duct Construction Standards.
2. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch diameter perforations, with overall open area of 23%.
3. Interstitial Insulation: Fibrous-glass liner complying with ASTM C1071, NFPA 90A or NFPA 90B; and NAIMA AH124, “Fibrous Glass Duct Liner Standard”.

a. Maximum Thermal Conductivity: 0.27 Btu x in./hr. x sq. ft. x deg F at 75 deg F mean temperature.
b. Install spacers that position the duct liner at uniform distance from the outer duct without compressing insulation.
c. Coat insulation with antimicrobial coating.
d. Cover insulation with polyester film complying with UL 181, Class 1.

H. Fasteners: Rivets, bolts, or sheet metal screws.

I. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used along or with tape, or heavy mastic.

J. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded. Stainless steel for stainless steel duct.

2.3 INSULATION

A. Internal: Glass fiber; ASTM C1071, G21 and G22 with an NRC not less than .65, 1.5 lb./.cu. ft. minimum density; smooth black matted air side surface for maximum 5000 FPM air velocity.

B. External (choose one of the following):

1. Flexible or rigid glass fiber; ASTM C1290 and C1136 all-service duct wrap; K value of .27 at 75 degrees F and a minimum installed R-value of R-6. Provide with foil scrim facing.
2. Reflectix (or equal) R-6.0 insulation having two layers of aluminum foil with polyethylene bonded for strength, and two inner layers of insulated bubbles; 5/16” thick; 1.25 oz./sq. ft. Flame and smoke 25/50.

C. Insulation material and jackets shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84.

D. Adhesives: Waterproof fire-retardant tape.

E. Lagging Adhesives: Fire resistive to ASTM E84, NFPA 255, UL723.

F. Impale Anchors: Galvanized steel, 12- gage, spot welded or self-adhesive pad. No anchors shall penetrate duct walls.

G. Joint Tape: Glass fiber cloth, open mesh.

H. Tie Wire: Annealed steel, 16-gage.

2.4 DUCT HANGERS

A. All duct hangers in direct contact with galvanized duct shall be galvanized steel.

B. All duct hangers in direct contact with stainless steel ducts shall be stainless steel.

PART 3 - EXECUTION

3.1 LOW PRESSURE DUCTWORK

A. Fabricate and support in complete accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible and ASHRAE handbooks latest editions, except as indicated. Provide duct material, gages, reinforcing, and sealing for operation pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation fill.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 30 degrees.

E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

F. Connect flexible ducts to metal ducts with draw bands or adhesive plus sheet metal screws.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

3.2 DUCTWORK INSTALLATION

A. Provide engineered openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring and maintain vapor barrier where applicable.

B. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

C. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use stainless steel for ductwork exposed to view and stainless steel or galvanized steel for ducts where concealed.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

E. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

F. Space between duct and floor or masonry wall openings shall be sealed with fire rated caulk.

G. Verify all field conditions before fabrication of ductwork to avoid installation conflicts. Notify Engineer of any conflict areas.

H. Do not change the designed path of ductwork, add excessive turns or offsets, or change duct sizes without first consulting the Engineer.

3.3 INSULATION INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Exterior Insulation Application

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
3. Continue insulation with vapor barrier though penetrations.

C. Internal Application

1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15-inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Seal and smooth joints. DO not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.

D. Insulation Schedule

1. All Supply, return, and outside air ductwork shall be insulated with external insulation unless otherwise noted.

2. Externally insulated ductwork shall be insulated using one of the following methods:

a. Ductwork shall be externally insulated with Reflectix (or equal) R-6.0 insulation having two layers of aluminum foil with polyethylene bonded for strength, and two inner layers of insulated bubbles; 5/16" thick; 1.25 oz./sq. ft. Flame and smoke 25/50.

1) Ductwork may also be insulated with fiberglass insulation, maintaining the insulation value of R-6.0, in lieu of Reflectix insulation.

3. Insulation must be installed in strict accordance with insulation manufacturer's requirements. Provide spacers, pins, bands, and adhesive as required. Special care must be taken on large ductwork to prevent sagging of insulation away from ductwork.
4. Interior exhaust duct shall not require insulation

5. Exterior mounted ductwork shall be externally insulated with 1½ inch rigid fiberglass board insulation with a vapor retarder and thermal conductivity of 0.23 at 75 degrees mean temperature providing a minimum R-value of R-8. Board insulation shall be protected (waterproofed) by self-stick laminate or reflective aluminum foil, rugged, cross-linked polymer films, and a thick layer of rubberized asphalt tested to ASTM D1970 like Peel & Seal by MFM Building Products Corp. or ArmaTuff by Armacell Engineered Foams or Alumaguard by Polyguard Products, Inc. or Ideal Seal 777, by American Biltrite, Inc.
6. Where duct is scheduled to be insulated (either externally or internally) herein and shown to be routed in an area that will be exposed based on Architectural drawings, the Contractor shall provide double-wall duct conforming with the specifications provided herein.
7. All ductwork insulation must conform to the minimum requirements of ASHRAE 90.1 (current edition) and International Energy Conservation Code (current edition) unless otherwise specified in this section.

3.4 HANGERS

A. Duct hangers may be directly attached to ducts. Ducts shall be hung by angles or straps as listed in the following schedule. Rods, straps, or angles may be used in trapeze hangers. Hangers shall be in accordance with the following schedule, except that there shall be no less than one set of hangers for each section of ductwork. Where elbows or tees are installed for changes in direction, hangers shall be provided. No ductwork shall rest on the building structural system. No ductwork shall be supported by suspended ceiling systems. All ductwork must be independently supported from building structural system.

B. Where trapeze hangers are used, the bottom of the duct shall be supported to angle sized as follows (for round ducts, the angle shall conform to the bottom 120 degrees of the duct):

Diameter of Duct	Width of Duct	Bottom Angle Sizes
0"-32"	0"-30"	1" x 1" x 1/8"
35" and Larger	31" - 48"	1-1/2" x 1-1/2" x 1/8"

C. All hangers shall be sufficiently across braced to eliminate, in the opinion of the Architect, excessive sway. Wherever ductwork contains filter sections, coils, fans, or other heavy equipment (excluding registers, grilles, diffusers, splitter dampers, etc.) such equipment shall be hung independently of the ductwork, with rods or angles of sizes adequate to support the load.

D. Special Duct Hanging Conditions

1. In the event ductwork interferes with suspended ceiling support hangers, provide cross members from hangers affected. These cross members shall be of reinforcing steel or furring channels and shall run under ductwork in question from which additional ceiling hangers shall be supported.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Duct Work	X	X						
Insulation	X	X					X	
Hangers	X	X						

END OF SECTION 233113

SECTION 233300 – DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Volume Control Dampers

B. Backdraft Dampers

C. Air Turning Devices

D. Flexible Duct Connectors

E. Duct Access Doors

F. Duct Test Holes

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

C. Section 233113 – Ductwork and Ductwork Insulation

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

A. Acceptable Manufacturers

1. United Enertech, Air Balance, American Warming, Arrow, Cesco, Creative Metals, Nailor, Ruskin, Vent Products, and Whiz Air.

B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

C. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heaver for sizes over 24 inches.

D. Fabricate splitter dampers to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4-inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

E. Fabricate single blade dampers for duct sizes to 12 inch.

F. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

G. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

H. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

2.2 BACKDRAFT DAMPERS

A. Acceptable Manufacturers

1. United Enertech, Air Balance, Arrow, Cesco, Nailor, Ruskin, and Vent Products.

B. Gravity backdraft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.

C. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 16 gage galvanized steel, with center pivoted blades of maximum 6-inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 AIR TURNING DEVICES

A. Acceptable Manufacturers

1. Ductmate Industries, Duro-Dyne, Metalaire, Semco, Ward Industries.

B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps. Provide in all square turns.

2.4 FLEXIBLE DUCT CONNECTORS

A. Acceptable Manufacturers

1. Ductmate Industries, Duro-Dyne, Vent Fabrics, Ward Industries.

B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

C. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per square yard, approximately 6 inches wide, crimped into metal edging strip.

2.5 DUCT ACCESS DOORS

A. Acceptable Manufacturers

1. American Warming, Cesco, Ductmate Industries, Kees, Safe Air/Dowco, Vent Fabrics

B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one-inch thick insulation with sheet metal cover.

D. Access doors smaller than 12 inches square may be secured with sash locks.

E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

F. Access doors with sheet metal screw fasteners are not acceptable.

2.6 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers where required.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

E. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8-inch size for hand access, 18 x 18-inch size for shoulder access, and as indicated.

F. Provide duct test holes where indicated and required for testing and balancing purposes.

G. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

H. Only dynamic fire dampers are to be used unless otherwise specified. Dynamic fire dampers are specifically to be used where heating, ventilating and air conditioning systems are designed to operate with fans on during a fire.

I. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Volume Control Dampers	X	X						
Fire Dampers	X	X						
Backdraft Dampers	X	X					X	
Air Turning Devices	X	X						
Flexible Duct Connectors	X	X						
Duct Access Doors	X	X						
Duct Test Holes	X	X						

END OF SECTION 233300

SECTION 233423 – POWER VENTILATORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Roof Exhaust Fans

B. Sidewall Exhaust Fans

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - General Provisions for Mechanical Work

C. Section 230529 - Supports and Anchors for HVAC Piping and Equipment

D. Section 230548 - Vibration Isolation for HVAC

E. Section 233113 – Ductwork and Ductwork Insulation

1.3 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

E. SMACNA - Low Pressure Duct Construction Standard.

1.4 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210.

B. Sound Ratings: AMCA 301, tested to AMCA 300.

C. Fabrication: Conform to AMCA 99.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Greenheck, Penn, Loren Cook, Jenn-Aire, Acme.

2.2 GENERAL

A. Provide all fans with disconnect.

B. Provide all fans with motor starters. See Section 230100 for details.

C. Integral phase relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Mechanical contractor shall coordinate staggered restart times as required.

D. See drawings or Specification Section 230900 – Instrumentation and Controls for HVAC for control of fans.

2.3 ROOF EXHAUST FAN

A. Roof exhaust fans shall be of the centrifugal, belt driven type. The fan housing shall be constructed of heavy gauge aluminum mounted on a rigid support structure. The shroud shall have a rolled bead and internal structural members. The fan wheel shall be of the aluminum backward curved, centrifugal type with inlet venturi for maximum performance. Wheels shall be dynamically and statically balanced. Motors and centrifugal wheels shall be mounted on vibration isolators.

B. Motors shall be isolated from the exhaust airstream. Air for cooling the motor shall be taken into the motor compartment from a location free from contaminants. Motors shall be readily accessible for maintenance.

C. A disconnect switch shall be factory installed and wired from the fan motor to the disconnect junction box. A conduit chase shall be provided for running electrical wiring through the curb cap into the power compartment.

D. All fans shall bear the AMCA Certified Ratings Performance Seal for both air and sound performance.

E. Provide with gravity back draft dampers.

F. Provide factory roof curb to match the slope of the roof, minimum 12-inch height.

2.4 SIDEWALL EXHAUST FAN

A. Sidewall exhaust fans shall be of the centrifugal, belt driven type. The fan housing shall be constructed of heavy gauge aluminum with a one-piece wind band with a rolled bead and internal structural members. The fan wheel shall be of the aluminum backward curved, centrifugal type with inlet venturi for maximum performance. Wheels shall be dynamically and statically balanced. Motors and centrifugal wheels shall be mounted on vibration isolators.

B. Motors shall be isolated from the exhaust airstream. Air for cooling the motor shall be taken into the motor compartment from a location free from contaminants. Motors shall be readily accessible for maintenance.

C. A disconnect switch shall be factory installed and wired from the fan motor to the disconnect junction box. A conduit chase shall be provided for running electrical wiring through the mounting cap into the power compartment.

D. All fans shall bear the AMCA Certified Ratings Performance Seal for both air and sound performance.

E. Provide with gravity back draft dampers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment in a manner to provide required clearances for proper operation and maintenance.

C. For roof mounted fans, secure roof exhausters with lag screws to roof curb.

PART 4 - SUBMITTALS

4.1 In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this

Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Roof Exhausters	X	X	X	X	X			
Sidewall Exhausters	X	X	X	X	X			

END OF SECTION 233423

SECTION 233713 – AIR DISTRIBUTION DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Diffusers

B. Registers/grilles

C. Louvers

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 – General Provisions for Mechanical Work

C. Section 233113 – Ductwork and Ductwork Insulation

D. Section 233300 - Ductwork Accessories

1.3 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - Low Pressure Duct Construction Standard.

1.4 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer listed in schedule is for design selection only.

B. Registers, Grilles, and Diffusers

1. Krueger, Metalaire, Price, Titus.

C. Louvers

1. Greenheck, Ruskin, and United Enertech.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Square, stamped, multicore type diffuser to discharge air in 360-degree pattern.

B. Provide for surface mount and inverted T-bar where shown. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabricate of steel with baked enamel finish.

D. Provide radial opposed blades damper adjustable from diffuser face for surface mounted unit where specified.

2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Fixed grilles of 1/2 x 1/2 x 1-inch louvers.

B. Fabricate margin frame with countersunk screw mounting or lay-in frame for suspended grid ceilings as shown in schedule on drawings.

C. Fabricate of aluminum with factory clear lacquer finish.

D. Where scheduled provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

E. All louver-faced grilles shall be provided with pattern controller blades unless scheduled otherwise on the Drawings.

2.4 WALL SUPPLY REGISTERS/GRILLES

A. Streamlined and individually adjustable blades, depth of which exceeds 3/4 inch with adjustable blades, vertical, horizontal face, and horizontal rear deflectors.

B. Fabricate margin frame with countersunk screw or concealed mounting and gasket suitable for surface or duct mounting.

C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.5 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Streamlined blades, fixed, non-adjustable, horizontal face.

B. Fabricate margin frame with countersunk screw or concealed mounting.

C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

2.6 LOUVERS

A. Provide louvers with blades on 37.5- or 45-degree slope, heavy channel frame, bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake.

B. Fabricate of extruded aluminum, welded assembly with factory bake-enamel finish.

C. Furnish with required flange to match installation required.

PART 3 - – EXECUTION

3.1 INSTALLATION

A. Furnish and install where shown on drawings all registers, grilles, diffusers and louvers in accordance with the tabulation in the schedule on drawings.

B. Provide accessories and modifications as indicated in schedule notes.

C. Install items in accordance with manufacturer’s instructions.

D. Install in locations as shown on drawings. Items have been located as shown to provide maximum performance. Coordinate with architectural features and notify Architect/Engineer of any conflicts.

E. Install diffusers to ductwork with air tight connection.

F. Provide accessible balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Diffusers	X	X						
Registers/Grilles	X	X						
Louvers	X	X						

END OF SECTION 233713

SECTION 235123 - GAS VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Listed double-wall vents.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for product.

B. Shop Drawings: For vents.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of hangers and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents.

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 - PRODUCTS

2.1 LISTED TYPE B AND BW VENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cleaver-Brooks.
2. Hart & Cooley Inc.
3. Heat-Fab, Inc.

B. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F continuously for Type B or 550 deg F continuously for Type BW; with neutral or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/4-inch airspace.

D. Inner Shell: ASTM A 666, Type 430 stainless steel.

E. Outer Jacket: Aluminized steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

2.2 LISTED TYPE L VENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Heat-Fab, Inc.
2. Metal-Fab, Inc.
3. Selkirk Corporation.

B. Description: Double-wall metal vents tested according to UL 641 and rated for 570 deg F continuously or 1700 deg F for 10 minutes; with neutral or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 2-inch airspace filled with high-temperature, ceramic-fiber insulation.

D. Inner Shell: ASTM A 666, Type 316 stainless steel.

E. Outer Jacket: Stainless steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude 98 percent of rainfall.

2.3 LISTED SPECIAL GAS VENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Heat-Fab, Inc.
2. Metal-Fab, Inc.
3. Selkirk Corporation.

B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.

D. Inner Shell: ASTM A 959, Type 29-4C stainless steel.

E. Outer Jacket: Stainless steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Listed Type B and BW Vents: Vents for certified gas appliances.

B. Listed Type L Vent: Vents for low-heat appliances.

C. Listed Special Gas Vent: Condensing gas appliances.

3.3 INSTALLATION OF LISTED VENTS

A. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

D. Lap joints in direction of flow.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

END OF SECTION 235123

SECTION 235523.13 - LOW-INTENSITY, GAS-FIRED, RADIANT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes low-intensity, gas-fired, forced-draft radiant heaters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of high-intensity, gas-fired, radiant heaters, as well as procedures and diagrams.
4. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gas-fired, radiant heaters to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Igniter: One hot-surface burner igniter(s) for each style of high-intensity, gas-fired, radiant heater furnished.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of radiant heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Period: All warranty periods listed below are from date of Substantial Completion.

a. Burner Assembly: Five years.
b. Combustion and Emitter Tubes: Three years.
c. Heater Controls: One year.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. CSA certified, with CSA Seal and certification number clearly visible on units indicating compliance with ANSI Z83.20/CSA 2.34.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FORCED-DRAFT HEATERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Roberts-Gordon, Inc.
2. Schwank Inc.
3. Solaronics, Inc.

B. Description: Factory-assembled, indoor, overhead-mounted, electrically controlled, low-intensity, infrared radiant heating units using gas combustion. Heater to have all necessary factory-installed wiring and piping required prior to field installation and startup.

C. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.

D. Burner Assembly:

1. Combustion-Air Inlet: Non-ducted, unvented.
2. Burner Control Housing: Steel.

a. Totally enclosed with steel access cover.
b. Finish: Powder-coated finish.

3. Burner: Stainless steel.
4. Ignition System: Hot-surface igniter with flame rod sensing capabilities.
5. Combustion Blower Fan: Dynamically balanced, direct-driven, forward-curved fan with stainless-steel impeller andsteel housing, with a minimum temperature rating of 450 deg F.
6. Motors: General requirements for motors are specified in Section 230100 "General Provisions for Mechanical."

a. Motor: Resilient-mounted, capacitor-start-capacitor-run type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.
b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

E. Combustion Chamber: 4-inch- (100-mm-) diameter, 12 or 16-gage, aluminized-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish. Chambers shall be equipped with sight glass for burner and pilot flame observation.

F. Emitter Tube: 4-inch- (100-mm-) diameter, 12 or 16-gage, aluminized-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish.

1. Exhaust Vent Termination: Vertical through roof with vent caps.

G. Reflector: Polished aluminum, with end caps. Shape to control radiation from tubing for uniform intensity at floor level with 100 percent cutoff above centerline of tubing. Reflectors or entire heater shall accommodate rotational adjustment from horizontal to a minimum 30-degree tilt from vertical.

H. Accessories:

1. Stainless-steel flexible connector with manual valve for gas supply.
2. Rigid mounting kits.
3. Clearance warning plaque.

2.3 CONTROLS AND SAFETIES

A. Gas Control Valve: Single-stage, regulated redundant 24-V ac gas valve that contains pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.

B. Failure Safeguards: 100 percent shutoff of gas flow in the event of flame or power failure.

C. Prepurge of 30 seconds of air control system prior to burner ignition.

D. Safety lockout of burner after flame is not reestablished within trial ignition period.

E. Blocked Vent Safety: Differential pressure switch in burner safety circuit to stop burner operation with high discharge or suction pressure.

F. Control Panel Interlock: Stops burner if panel is open.

G. Indicator Lights: "Airflow-on" and "burner-on" indicator lights.

H. Thermostat: Single-stage, wall-mounted type with 50 to 90 deg F operating range and fan on switch.

1. Control Transformer: Integrally mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine structures, substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances, required clearances, and other conditions affecting performance of the Work.

B. Examine roughing-in for fuel-gas piping to verify actual locations of piping connections before equipment installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Installation: Install gas-fired, radiant heaters and associated gas features and systems according to NFPA 54.

B. Suspended Units: Mount to substrate using manufacturer's rigid mounting kits or custom fabricated brackets.

1. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Maintain manufacturers' recommended clearances for combustibles.

3.3 CONNECTIONS

A. Gas Piping: Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

1. Gas Connections: Connect gas piping to radiant heaters according to NFPA 54.

B. Where installing piping adjacent to gas-fired, radiant heaters, allow space for service and maintenance.

C. Vent Connections: Comply with Section 233113 "Metal Ducts" and with Section 235123"Gas Vents."

D. Electrical Connections: Comply with applicable requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify bearing lubrication.
3. Verify proper motor rotation.
4. Test Reports: Prepare a written report to record the following:

a. Test procedures used.
b. Test results that comply with requirements.
c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Gas-fired, radiant heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial-temperature set points.

B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired, radiant heaters.

END OF SECTION 235523.13

SECTION 237416 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, large-capacity, rooftop air conditioning units (RTUs) with the following components and accessories:

1. Casings.
2. Fans.
3. Motors.
4. Coils.
5. Refrigerant circuit components.
6. Air filtration.
7. Gas furnaces.
8. UV germicidal irradiation section.
9. Dampers.
10. Controls.
11. Accessories
12. Roof curb adapter.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electronically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, large-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

E. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

F. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during

heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

1. Factory selection calculations for each antimicrobial ultraviolet lamp installation.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
3. Seismic-Restraint Details: Detail fabrication and attachment of wind and seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which RTUs will be attached.
2. Roof openings.
3. Roof curbs and flashing.

B. Product Certificates: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Seismic Qualification Data: Certificates, for RTUs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Restraint of internal components, including fans, coils, and refrigeration components.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: Two sets for each belt-driven fan.
2. Filters: Two sets of filters for each unit.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.
5. Warranty Period for Antimicrobial Ultraviolet Lamp System: Lifetime with exception of lamps.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. AHRI Compliance:

1. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 270 for testing and rating sound performance for RTUs.
3. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.
4. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested in accordance with AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

C. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.

F. UL Compliance: Comply with UL 1995.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AAON.
2. Carrier Corporation; a unit of United Technologies Corp.
3. Daikin Applied.
4. Trane.
5. Approved Equal.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design mounting and restraints for RTUs, including comprehensive engineering analysis.

1. Design RTU supports to comply with seismic performance requirements.

B. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined according to ASCE 7-10 and general structural notes.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified".

2.4 CASINGS

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Double-Wall Construction: Fill space between walls with a minimum of 1 inch foam insulation and seal moisture tight for R-7 performance.

C. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

D. Inner Casing Fabrication Requirements:

1. Inside Casing: G-90-coated galvanized steel, 0.034 inch thick.

E. Condensate Drain Pans: Fabricated using stainless 0.025 inch thick steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1 for design and construction of drain pans.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Threaded nipple.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 FANS

A. Supply-Air Fans: Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

1. Direct-Driven Supply-Air Fans: Motor shall be resiliently mounted in the fan inlet.
2. Belt-Driven Supply-Air Fans: Motors shall be installed on an adjustable fan base resiliently mounted in the casing.

B. Condenser-Coil Fan: Variable-speed propeller, mounted on shaft of permanently lubricated variable speed motors.

C. Return and/or Relief-Air Fan: Forward curved, shaft mounted on permanently lubricated motor.

D. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when fan-mounted frame and RTU-mounted frame are anchored to building structure.

2.6 MOTORS

A. Comply with Section 230100 "General Provisions for Mechanical" and the requirements of this Article.

B. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

C. Service Factor: 1.15.

D. Efficiency: Premium efficient.

E. NEMA Design: MG-1.

2.7 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.

B. Hot-Gas Reheat Refrigerant Coil:

1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Suction-discharge bypass valve.

2.8 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: One or two.

B. Compressor: Hermetic, variable speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Hot-gas reheat solenoid valve modulating with a replaceable magnetic coil.
10. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
11. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.9 AIR FILTRATION

A. Minimum arrestance and a minimum efficiency reporting value according to ASHRAE 52.2.

B. Pleated Panel Filters:

1. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.
2. Pleated 1 inch: MERV 8.
3. Media: Cotton and synthetic fibers coated with nonflammable adhesive.

a. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
b. Adhesive: As recommended by air-filter manufacturer and that complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
c. Media shall be coated with an antimicrobial agent.
d. Separators shall be bonded to the media to maintain pleat configuration.
e. Welded-wire grid shall be on downstream side to maintain pleat.
f. Media shall be bonded to frame to prevent air bypass.
g. Support members on upstream and downstream sides to maintain pleat spacing.

2.10 GAS FURNACES

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve with vertical extension.

E. Safety Controls:

1. Gas Control Valve: Modulating.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.11 ANTIMICROBIAL ULTRAVIOLET LAMP SYSTEM

A. Description: Lighting unit installation in rooftop unit with lamps, reflectors, remote water-resistant power supply and cable, and support brackets. Lamps emit 254 nm UV "C" (UVC) band. In metal housing with viewport arranged for and controlled to cycle on and off with cooling coil. Locate downstream of cooling coils and over condensate drain pans.

2.12 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, for 0 to100 percent outdoor air, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage or gears and interconnect so dampers operate simultaneously.

1. Leakage Rate: As required by ASHRAE/IES 90.1.
2. Damper Motor: Modulating with adjustable minimum position.
3. Relief-Air Damper: Motorized, as required by ASHRAE/IES 90.1, with bird screen and hood.

C. Motorized relief dampers.

2.13 CONTROLS

A. See Control Drawing M-702.

B. Control equipment is specified in Section 230900 “Instrumentation and Controls”.

C. Basic Unit Controls:

1. Control-voltage transformer.
2. Wall-mounted thermostat or sensor with the following features:

    a. Heat-cool-off switch.
    b. Fan on-auto switch.
    c. Fan-speed switch.
    d. Automatic changeover.
    e. Adjustable deadband.
    f. Exposed set point.
    g. Exposed indication.
    h. Degree F indication.
    i. Unoccupied-period-override push button.
    j. Data entry and access port to input temperature and humidity set points, occupied and unoccupied periods, and output room temperature and humidity, supply-air temperature, operating mode, and status.

3. Wall-mounted humidistat or sensor with the following features:

    a. Exposed set point.
    b. Exposed indication.

4. Remote Wall-Mounted Annunciator Panel for Each Unit:

    a. Lights to indicate power on, cooling, heating, fan running, filter dirty, and unit alarm or failure.
    b. DDC controller or programmable timer and interface with HVAC instrumentation and control system.
    c. Digital display of outdoor-air temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.

D. DDC Controller:

1. Controller shall have volatile-memory backup.
2. Safety Control Operation:

    a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
    b. Firestats: Stop fan and close outdoor-air damper if air greater than 130 deg F enters unit. Provide additional contacts for alarm interface to fire alarm control panel.
    c. Fire Alarm Control Panel Interface: Provide control interface to coordinate with operating sequence described in Section 283110 “Fire Alarm.”
    d. Low-Discharge Temperature: Stop fan and close outdoor-air damper if supply air temperature is less than 40 deg F.
    e. Defrost Control for Condenser Coil: Pressure differential switch to initiate defrost sequence.

3. Scheduled Operation: Occupied and unoccupied periods on 365-day clock with a minimum of four programmable periods per day.
4. Unoccupied Period:

    a. Heating Setback: See Drawing M-702.

b. Cooling Setback: See Drawing M-702.
c. Override Operation: Two hours.

5. Supply Fan Operation:

a. Occupied Periods: Run fan continuously.
b. Unoccupied Periods: Cycle fan to maintain setback temperature.

6. Refrigerant Circuit Operation:

a. Occupied Periods: Cycle or stage compressors to match compressor output to cooling load to maintain room temperature and humidity. Cycle condenser fans to maintain maximum hot-gas pressure. Operate low-ambient control kit to maintain minimum hot-gas pressure.
b. Unoccupied Periods: Cycle compressors and condenser fans for heating to maintain setback temperature.
c. Switch reversing valve for heating or cooling mode on air-to-air heat pump.

7. Hot-Gas Reheat-Coil Operation:

a. Occupied Periods: Humidistat opens hot-gas valve to provide hot-gas reheat, and cycles compressor.
b. Unoccupied Periods: Reheat not required.

8. Gas Furnace Operation:

a. Occupied Periods: Modulate burner to maintain room temperature.
b. Unoccupied Periods: Cycle burner to maintain setback temperature.

9. Fixed Minimum Outdoor-Air Damper Operation:

a. Occupied Periods: Open to minimum percent.
b. Unoccupied Periods: Close the outdoor-air damper.

10. Economizer Outdoor-Air Damper Operation (see Drawing M-702):

a. Unoccupied Periods: Close outdoor-air damper and open return-air damper.
b. Outdoor-Airflow Monitor: Accuracy maximum plus or minus 5 percent within 15 and 100 percent of total outdoor air. Monitor microprocessor shall adjust for temperature, and output shall range from 2- to 10-V dc or 4 to 20 mA.

11. Carbon Dioxide Sensor Operation:

a. Occupied Periods: Reset minimum outdoor-air ratio down to maintain maximum 700ppm concentration difference between ambient outside air CO_2 levels and space CO_2 levels.
b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.

12. Terminal-Unit Relays:

a. Provide heating- and cooling-mode changeover relays compatible with terminal control system required in Section 230900 "Instrumentation and Controls."

E. Interface Requirements for HVAC Instrumentation and Control System:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet compatible interface for central HVAC control workstation for monitoring and controlling the following:

a. Drawing M-702 points.
b. Set points.
c. Monitoring supply fan start, stop, and operation.
d. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.
e. Occupied and unoccupied operations.
f. Constant and variable motor loads.
g. Variable-frequency drive operation.
h. Cooling load.
i. Economizer cycles.
j. Air-distribution static pressure and outdoor air ventilation air volume.

2.14 ACCESSORIES

A. Electric heater with integral thermostat maintains minimum 50 deg F temperature in gas burner compartment.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

C. Remote potentiometer to adjust minimum economizer damper position.

D. Return-air bypass damper.

E. Factory- or field-installed demand-controlled ventilation.

F. Safeties:

1. Smoke detector.
2. Condensate overflow switch.
3. Phase-loss reversal protection.
4. High and low pressure control.
5. Gas furnace airflow-proving switch.

G. Coil guards of painted, galvanized-steel wire.

H. Hail guards of galvanized steel, painted to match casing.

I. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

J. Vertical vent extensions to increase the separation between the outdoor-air intake and the flue-gas outlet.

K. Door switches to disable heating or reset set point when open.

L. Outdoor air intake weather hood.

2.15 ROOF CURB ADAPTERS

A. Type: Acoustical pressurized plenum curb with noise blocking panels.

B. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 2 inches.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb Adapter: Install on roof curb, level and secure, according to NRCA's "NRCA Roofing Manual. Install adapters on curbs and coordinate supply air and return air plenums with RTU's. Secure RTUs to curb adapter, and secure curb adapter to roof curb with bolts per manufacturer's instructions.

B. Unit Support: Install unit level on curb adapter. Coordinate roof penetrations and with roof construction. Secure RTUs to curb adapter.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection. Pipe insulated condensate piping to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 231000 "Plumbing Piping and Valves." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at acoustical pressurized plenum curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

D. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch (13 mm) high.
3. Locate nameplate where easily visible.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. RTU will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions.

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.

19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F (8 deg C) above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 237416

SECTION 238127 – MINI-SPLIT SYSTEM AIR CONDITIONER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Fan coil unit

B. Outdoor unit

C. Refrigerant piping

D. Controls

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - GENERAL PROVISION FOR MECHANICAL WORK

C. See drawings for further conditions, requirements and schedules.

1.3 WARRANTY

A. Provide two-year parts and labor warranty on equipment and five-year warranty on compressors.

PART 2 - PRODUCTS

2.1 DUCTLESS SPLIT SYSTEMS

A. Provide self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, controls, air filter, refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.

2.2 ACCEPTABLE MANUFACTURERS

A. Trane, Mitsubishi.

2.3 INDOOR UNIT

A. The indoor unit shall be completely factory assembled and tested. Units shall have factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics,

auto restart function, 3-minute fused time delay and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The front grille shall be easily removed for cleaning.

B. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

C. Both refrigerant lines shall be insulated from the outdoor unit.

D. The indoor units shall be equipped with a return air thermistor.

E. Unit Cabinet

1. The indoor unit shall have a white, “flat screen” finish.
2. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, right bottom, left side, left back and left bottom).
3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.

F. Fan

1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
3. An auto-swing louver for adjustable air flow (vertically) shall be standard.

G. Coil

1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
2. All tube joints shall be brazed with silver alloy or phoscopper.
3. All coils will be factory pressure tested.
4. Condensate pad shall be located in unit.
5. Provide with a remote condensate pump for condensate removal. Power from unit.

H. Filter

1. The return air filter provided will be a mildew proof, removable and washable filter.

I. Refrigerant Piping

1. All refrigeration piping shall be Type ACR hard drawn copper tubing and shall be precapped, precleaned and dry nitrogen charged at the factory. This piping shall be capped throughout the construction to prevent any foreign materials from entering the piping. Fittings shall be wrought copper solder joint type. Dry nitrogen shall be bled through piping while joints are being brazed. Joints shall be as follows:

    a. Copper to Brass - Silver Solder

b. Copper to Copper - Silfos.

2. Joints: Copper tubing connections shall be made up with 95/5 tin antimony solder or silfos, in accordance with the recommendations of the manufacturer or as specified hereinafter.
3. Refrigerant Piping Insulation: Armstrong Armaflex insulation ½" thick with fittings covered with mitered sections of insulation and sealed with 520 adhesive. All insulation on outdoor installation shall be additionally protected with two (2) coats of Armaflex vinyl-lacquer type finish.

J. Controls

1. As noted in equipment schedule, unit shall be provided with either a wall-mounted thermostat or a remote mounted with wall bracket.
2. The unit shall have a wall mounted remote infra-red controller capable to operate the system. Provide wall-mounting bracket to mount adjacent to light switch.
3. The unit shall also be provided with wall-mounted thermostat to be mounted adjacent to light switch. Unit shall be capable of operating based on return air temperature or thermostat reading, as programmed at the wall-mounted thermostat.
4. The infrared remote controller and wall controller shall both consist of an On/Off Power switch, Mode Selector, Fan Setting, On/Off Timer Setting, Temperature Adjustment.

    a. On/Off switch power the system on or off mode.
    b. Mode selector shall operate the system in auto, cool, heat (if available), fan or dry operation.
    c. Fan setting shall provide high, medium or low fan speed.
    d. On/Off timer is used for automatically switching the unit on or off.
    e. Temperature adjustment allows for the increase or decrease of the desired temperature.

2.4 OUTDOOR UNIT

A. Unit Cabinet

1. The outdoor unit shall be completely weatherproof and corrosive resistant.
2. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

B. Fan

1. The fan shall be a direct drive, propeller type fan.
2. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
3. A fan guard is provided on the outdoor unit to prevent contact with fan operation.

C. Coil

1. The outdoor coil shall be nonferrous construction with corrugated fin tube.
2. Refrigerant flow from the condenser will be controlled via a metering device.

D. Compressor

1. The compressor shall be a rotary swing inverter-driven compressor.
2. The compressor shall have an internal thermal overload.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all components in accordance with manufacturer's recommendation.

B. Install all components in a manner to provide clearances required for proper operation and maintenance.

C. Furnish equipment with charge of refrigerant and oil.

D. Coordinate electrical connections required.

3.2 DEMONSTRATION

A. Provide owner's maintenance personnel training as required to adjust, operate and maintain pumps.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Mini-Split System AC	X	X	X	X	X			

END OF SECTION 238127

SECTION 238239 – ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electric Cabinet Heaters

B. Electric Unit Heaters

C. Electric Ceiling Mounted Heaters

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices insofar as they affect this portion of the work.

B. Section 230100 - GENERAL PROVISIONS FOR MECHANICAL WORK

C. See drawings for further conditions, requirements, and schedules.

1.3 QUALITY ASSURANCE

A. All electrical components and accessories shall be listed and labeled per requirements of NFPA 70, Article 100.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Chromalox, MSI, International, Markel, Sentinel, Becko, Trane, and TPI/Reddi.

2.2 ELECTRICAL CABINET HEATERS

A. Basic Unit: Shall include chassis, coil, shall be fanwheel(s), housing(s), motor and insulation. Chassis shall be galvanized steel wrap-around structural frame with all edges flanged. Insulation is faced, heavy density glass fiber.

B. Cabinet Finish: All cabinet parts shall be cleaned, bonderized, phosphatized, and flow-coated with baked-on primer. Provide final finish of spray applied baked-on enamel.

C. Electric Heating Coils: Hydronic type finned-tube construction with resistance elements inserted in tubes. Units factory wired with unit mounted heat switch, magnetic contactors, high temperature cutout safety control and fan override thermostat.

D. Fans: Fan wheels shall be centrifugal, forward-curved, double width of aluminum.

E. Motors: All motors shall have integral thermal overload protection and start at 78% of rated voltage. Motors shall operate satisfactorily at 90% of rated voltage on all speed settings and at 10% over voltage without undue magnetic noise. Temperature rise by winding resistance method shall not exceed 50 C (PSC motors) on high speed. All motors shall be factory run tested assembled in unit prior to shipping. Motor cords shall be quickly detachable at junction box by locking prong connector on vertical cabinet and wall hung units.

F. Disconnect Switch: Factory wired, non-fusible in-housing.

G. Electrical Performance: All cataloged models shall be wired in accordance with National Electric Code and be Underwriters' Laboratories, Inc., listed. Junction box for motor cord shall be provided unless otherwise specified.

H. Provide factory standard discharge grilles.

I. Filters: Provide 1" thick throwaway filter on all cabinet models.

2.3 ELECTRIC UNIT HEATERS

A. Provide vertical unit heaters with heating and air delivery capacities as shown in schedule on drawings. The cabinet shall be made of 18 gauge die formed, furniture grade steel. Individual adjustable louvers with 30 degree downward stops shall be furnished to provide desired control of discharge air. All metal surfaces of the casing shall be phosphate coated to resist corrosion and finished in baked enamel. Heat to be of the draw-through air flow design.

B. The electric heating bank shall consist of metal sheath heating elements. The elements shall have a copper clad steel sheath and corrosion resistance, and aluminum fins. Automatic reset thermal over-heat protection, shall be of the linear capillary type wired for instantaneous de-energizing in case of thermal overload. Heating bank to have protective air inlet louvers.

C. Motors shall be of the totally enclosed, continuous heavy-duty all-angle operation equipped with built-in thermal overload protection.

D. Fans shall be aluminum directly connected to fan motor, designed specifically for unit heat application.

E. Controls: Provide unit mounted thermostat to maintain space temperature unless otherwise noted.

F. All heaters shall be U.L. listed and meet the requirements of the National Electrical Code.

2.4 ELECTRIC CEILING MOUNTED HEATERS

A. Heater Section: The heater section shall consist of a 20 gauge steel chassis on which are mounted the heating elements, fan motor and blade, fan control, thermal cutout and 3-pole contactor. Heater section shall be completely prewired.

B. Heater Elements: The heating elements shall be guaranteed for five years and shall be of non-glowing design consisting of 80/20 NiCh resistence wire, enclosed in a steel sheath, to which steel plate fins are brazed. The elements shall cover the entire air intake area to ensure uniform heating of all discharged air.

C. Motor and Controls: The fan motor shall be impedance-protected, permanently lubricated and with totally-enclosed rotor. Fan control shall be bi-metallic, snap-action type and shall activate fan and heating element when the thermostat calls for heat and continue to operate the fan after the thermostat is satisfied and until all heated air has been discharged. Thermal cutout shall be bi-metallic snap-action type designed to automatically shut off heater in the event of overheating and reactivate the heater when temperature returns to normal.

D. Operational Controls: Disconnect switch, and all interlock relays shall be installed within the heater enclosure.

E. Recess Enclosure

1. The box shall be designed for duty as a recessed rough-in box in masonry, T-Bar, or frame ceiling construction. The back box shall be 20 gauge galvanized steel and shall contain knockouts through which field wiring leads are brought. Enclosure to recess into a maximum 7 inches of ceiling space. An independent support system shall be used for T-Bar installation.
2. The louvered recess faceplate shall be of 20 gauge cold rolled steel, phosphatized then electrostatically painted Antique White by a baked enamel process.

F. Surface Enclosure

G. The surface mounting plate shall be designed for duty as a rough-in box or masonry, T-Bar, or frame ceiling construction. The surface mounting plate shall be 20 gauge galvanized steel and shall contain knockouts through which field wiring leads are brought. Enclosure to extend a maximum of 16 inches into the heated space. An independent support system shall be used for T-Bar installation.

H. The louvered surface wrapper shall be a contoured aluminum extrusion and 20 gauge sheet metal combination with rounded corners. The surface wrapper shall be electrostatically painted Antique White by a baked enamel process.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all units and accessories in accordance with manufacturer’s recommendations.

B. Install all units in a manner to provide clearances for proper operation accessibility and maintenance.

C. Coordinate electrical connections required.

3.2 DEMONSTRATION

A. Provide Owner's maintenance personal training as required to adjust, operate and maintain heaters.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Cabinet Heaters	X	X	X	X	X			
Unit Heaters	X	X	X	X	X			
Ceiling Mounted Heaters	X	X	X	X	X			

END OF SECTION 238239

SECTION 260000 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 CONTRACTOR'S UNDERSTANDING

A. Contractors bidding work under this Contract shall read and understand Division 00 and Division 01 - General Requirements. If any discrepancies are discovered between the Basic Electrical Materials and Methods and General Requirements, the above-mentioned documents shall overrule this section. The Basic Electrical Materials and Methods are intended as a supplement to the above-mentioned documents.

B. The Contractor shall bid as outlined in the above-mentioned Specifications and shall be governed by any alternates or unit prices called for in the form of proposal.

C. Each Contractor bidding on the work included in these Specifications shall view the building site and carefully examine the contract Drawings and Specifications, so that he/she may fully understand what is to be done, and to document existing conditions.

1.2 SCOPE OF WORK

A. Work included in this section of the Specifications shall include the furnishing of all labor, material, tools, approvals, utility connection fees, excavation, backfill, and other equipment necessary to install the electrical system as shown on the Contract Drawings and as specified herein.

B. It also includes installation and connection of all electrical utilization equipment included in this Contract but furnished by other contractors or suppliers.

C. It is the general intent that all motors shall be furnished with the particular object of equipment it drives, except where a new motor is to be provided for an item of existing equipment (a replacement motor), then it shall be provided under this Division of the Specifications.

D. The Contractor shall furnish and install all conduit, wire, disconnect switches and miscellaneous material to make all electrical connections to all items of utilization equipment or wiring devices except as otherwise specified.

E. Equipment connections shall be made with flexible or rigid conduit as required. Controllers for motors, disconnect switches, and all control, protective and signal devices for motor circuits, except where such apparatus is furnished mounted and connected integrally with the motor driven equipment, shall be installed, connected, and left in operating condition. The number and size of conductors between motors and control or protective apparatus shall be as required to obtain the operation described in these Specifications, and/or by the Contract Documents, and/or as shown in manufacturer furnished, Engineer reviewed Shop Drawings.

F. All devices and items of electrical equipment, including those shown on the Contract Drawings but not specifically mentioned in the Specifications or those mentioned in the Specifications but not shown on the Contract Drawings, are to be furnished under this section of the specifications. Any such device or item of equipment, if not defined in quality, shall be equal to similar Equipment and/or devices specified herein.

G. All devices and items of equipment mentioned in this section of the Specifications whether electrical or not or whether furnished under this or other Division of the Specifications, shall be installed under this Division of the Specifications, unless specifically indicated otherwise.

H. Where wiring diagrams are not shown on the Contract Drawings, they are to be provided by the supplier of the equipment served and such diagrams shall be adhered to except as herein modified.

I. The following is a list of items that may not be defined clearly on the Contract Drawings or in other parts of these Specifications. The list is meant to be an aid to the Contractor and is not necessarily a complete list of all work to be performed under this Contract:

1. Connect all HVAC equipment and accessories furnished by equipment suppliers.
2. Furnish, install, and connect all motor controls, unless otherwise noted.
3. Furnish, install, and connect lighting and controls, indoor and outdoor.
5. Furnish, install, and connect all electrical conduit, duct, and cables.
6. Furnish, install, and connect all telecommunications boxes, outlets, conduit, etc.
7. Furnish, install, and connect all power distribution equipment.
8. Furnish and install standby power equipment.
9. Furnish and install all fire alarm boxes, outlets, conduit, etc.
10. Furnish and install all video surveillance boxes, outlets, conduit, etc.
11. Furnish and install all security system boxes, outlets, conduit, etc.
12. Furnish and install all access control system boxes, outlets, conduit, etc.
13. All HVAC control wiring is by the Temperature Controls Contractor for Division 23.

J. All raceways and wiring shall be fire stopped where required by code and/or indicated in the Contract Drawings, as specified in Section 078413.

1.3 SHOP DRAWINGS, DESCRIPTIVE LITERATURE, INSTALLATION, OPERATION AND MAINTENANCE INFORMATION

A. Shop Drawings including descriptive literature and/or installation, operation and maintenance instructions shall be submitted in the amount of 8 copies for this Division. All Shop Drawings shall be submitted in loose-leaf three-ring cardboard reinforced vinyl binders.

B. Shop Drawings shall be submitted on the following materials specified in this Division:

1. Conduit - all types and sizes, including liquid-tight flexible.
2. Boxes - all types and sizes.
3. Coal tar epoxy paint.
4. Wiring devices.
5. Device plates.
6. Metal framing system (Strut type channel).
7. Conduit fittings, expansion joints, support hardware.
8. Motor control equipment - including individually mounted items and pole top items.
9. Power distribution equipment - including individually mounted items.
10. Wire - all types and sizes.

11. Light fixtures - all types.
12. Lighting control systems, occupancy sensing devices, etc.
13. Wire markers, signs, and labels.
14. Lightning/transient suppressors.
15. Standby power equipment and accessories.
16. Busway and accessories.

C. The Engineer reserves the right to make modifications to motor control and power distribution equipment ratings after Shop Drawing review, if the Shop Drawings are submitted prematurely (prematurely meaning submitted before all utilization equipment has been reviewed and accepted). Cost of modifications shall be the Contractor's responsibility.

1.4 SYMBOLS AND ABBREVIATIONS

A. The symbols and abbreviations general follow standard electrical and architectural practice; however, exceptions to this shall be as shown on the Contract Drawings.

1.5 COORDINATION WITH OTHER TRADES

A. The Contractor shall coordinate the electrical work with that of other trades to ensure proper final location of all electrical equipment and/or connections. The Contractor shall verify door swings to see that light switches are located properly.

1.6 CODES

A. The minimum standard for all work shall be the 2015 revision of the International Building Code (IBC) except for the section entitled "Fire Protection", WV Fire Code and the 2014 National Electrical Code (NEC). Whenever and wherever state and/or local laws or ordinances and/or regulations and/or the Engineer's design require a higher standard that the current NEC or KBC, then these laws and/or regulations and/or the design shall be followed.

B. Following is a list of other applicable Standards or Codes:

1.	International Building Code	IBC
2.	WV State Fire Code	WVFC
3.	National Electrical Code	NEC
4.	National Electrical Safety Code	NESC
5.	Underwriters Laboratories, Inc.	UL
6.	Factory Mutual System	FM
7.	National Fire Protection Association	NFPA
8.	National Electrical Manufacturers Association	NEMA
9.	Occupational Safety and Health Administration	OSHA
10.	Insulated Cable Engineers Association, Inc.	ICEA
11.	Illuminating Engineering Society of North America	IES
12.	Instrument Society of America	ISA
13.	Institute of Electrical and Electronic Engineers, Inc.	IEEE
14.	Certified Ballast Manufacturers Association	CBM

15.	American National Standards Institute, Inc.	ANSI
16.	Anti-Friction Bearing Manufacturers Association, Inc.	AFBMA
17.	Joint Industry Council	JIC
18.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.	ASHRAE
19.	Federal Communications Commission	FCC
20.	American Society for Testing and Materials	ASTM
21.	American Wood Preservers Association	AWPA
22.	Rural Electrification Association	REA

1.7 INSPECTIONS AND PERMITS

A. Inspection of the electrical system on all construction projects is required. If the local government has appointed a state licensed inspector, the Contractor shall be required to use that person to perform the inspections. If a locally mandated inspector does not exist, the Contractor shall select and hire a state licensed inspector, who has jurisdiction before any work is concealed. The Contractor shall notify the electrical inspector in writing, immediately upon notice to proceed, and a copy of the notice shall be submitted to the Engineer.

B. At the time of completion of the project, there shall be furnished to the Owner a certificate of compliance, from the agency having jurisdiction pursuant to all electrical work performed. The Engineer shall also receive a copy.

C. All costs incurred by the Contractor to execute the above-mentioned requirements shall be paid by the Contractor at no extra cost to the Owner.

D. All permits necessary for the complete electrical system shall be obtained by the Contractor from the authorities governing such work. For further information, see Division 01.

1.8 STORAGE

A. All work, equipment, and materials shall be protected against dirt, water, or other injury during the period of construction.

B. Sensitive electrical equipment such as light fixtures, motor starters, controls, and panelboards, delivered to the job site, shall be protected against injury or corrosion due to atmospheric conditions or physical damage by other means. Protection is interpreted to mean that equipment shall be stored under roof, in a structure properly heated in cold weather and ventilated in hot weather. Provision shall be made to control the humidity in the storage area to 50 percent relative. The stored equipment shall be inspected periodically, and if it is found that the protection is inadequate, further protective measures shall be employed. Electrical equipment other than boxes and conduit shall not be installed until the structure is under roof with doors and windows installed.

C. No light fixtures or device plates shall be hung or installed until after painting is completed; however, temporary lighting shall be provided by the Contractor.

1.9 MATERIALS

A. All materials used shall be new and at least meet the minimum standards as established by the NEC and/or National Electrical Manufacturers Association (NEMA). All materials shall be UL listed for the application, where a listing exists. Additional requirements are found in Division 01. All equipment shall meet applicable FCC requirements and restrictions.

B. The material and equipment described herein has been specified according to a particular trade name or make to set quality standards. However, each Contractor has the right to substitute other material and equipment in lieu of that specified, other than those specifically mentioned at matching or for standardization, providing such material and equipment meets all the requirements of those specified and is accepted, in writing by the Engineer.

1.10 ERRORS, CORRECTIONS, AND/OR OMISSIONS

A. Should a piece of utilization equipment be supplied of a different size or horsepower than shown on the Contract Drawings, the Contractor shall be responsible for installing the proper size wiring, conduit, starters, circuit breakers, etc., for proper operation of that unit and the complete electrical system at no extra cost to the Owner.

B. It is the intent of these Specifications to provide for an electrical system installation complete in every respect, to operate in the manner and under conditions as shown in these Specifications and on the Contract Drawings. The Contractor shall notify the Engineer, in writing, of any omission or error at least 10 days prior to opening of bids. In the event of the Contractor's failure to give such notice, he/she may be required to correct work and/or furnish items omitted without additional cost. Further requirements on this subject may be found in the General Requirements, Division 01.

C. Necessary changes or revisions in electrical work to meet any code or power company requirement shall be made by the Contractor without additional charge.

1.11 GUARANTEES AND WARRANTIES

A. The Contractor shall guarantee all work including equipment, materials, and workmanship. This guarantee shall be against all defects of any of the above and shall run for a period of 1 year from the date of acceptance of the work, concurrent with the one-year guarantee period designated for the general construction contract under which electrical work is performed. Date of acceptance shall be the date on which all "punch list" items are completed ("punch list" is defined to be the written listing of work that is incomplete or deficient that must be finished or replaced/repaired before the Contractor receives final payment).

B. Repair and maintenance for the guarantee period is the responsibility of the Contractor and shall include all repairs and maintenance other than that which is considered as routine. (That is oiling, greasing, etc.) The Engineer shall be the judge of what shall be considered as routine maintenance.

1.12 TESTING

A. After the wiring system is complete, and at such time as the Engineer may direct, the Contractor shall conduct an operating test for acceptance. The equipment shall be demonstrated to operate in accordance with the requirements of these Specifications and the Contract Drawings. The test shall be performed in the presence of the Engineer or his authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, as well as the necessary electrical power.

B. Before energizing the system, the Contractor shall check all connections and set all relays and instruments for proper operation. He shall obtain all necessary clearances, approvals, and instructions from the serving utility company and/or equipment manufacturers prior to placing power on the equipment.

C. Tests may be performed by the Engineer to determine integrity of insulation on wiring circuits selected by the Engineer at random.

D. Cost of utilities for testing done prior to beneficial occupancy by the Owner shall be borne by the Contractor.

1.13 CLEANUP

A. Cleanup shall be completed as soon as possible after the electrical installation is complete. All light fixtures, outlets, switches, starters, motor control centers, disconnect switches and other electrical equipment shall be free of shipping tags, stickers, etc. All painted equipment shall be left free of scratches or other blemishes, such as splattered or blistered paint, etc. All light fixture diffusers shall be clean and the interior of all motor controls, etc., shall be free of dust, dirt, wire strippings, etc. Surplus material, rubbish and equipment resulting from the work shall be removed from the job site by the Contractor upon completion of the work.

B. During construction, cover all Owner equipment and furnishings subject to mechanical damage or contamination in any way.

1.14 CUTTING AND PATCHING

A. Cutting and patching shall be held to an absolute minimum and such work shall be done only under the direction of the Engineer or Owner. The Contractor shall be responsible for and shall pay for all openings that may be required in the floors or walls, and he shall be responsible for putting said surfaces back in their original condition. Every attempt shall be made to avoid cutting reinforcing steel bars when an opening is required in a reinforced concrete wall or floor slab.

1.15 EXCAVATION AND BACKFILL

A. Excavation

1. Excavation for conduits shall be of sufficient width to allow for proper jointing and alignment of the type conduit used. Conduit shall be bedded on original ground. Where conduit is in solid rock, a 6-inch earth cushion must be provided. Conduit shall be laid in straight lines between pull boxes and/or

structures unless otherwise notes on the Contract Drawings. The cost of solid rock excavation shall be included in the lump sum bid with no extra pay allowed (unclassified).

B. Backfill

1. Backfill shall be hand placed, loose granular earth for a height of 6 inches above the top of the largest conduit. This material shall be free of rocks over 2 inches in diameter. Above this, large rocks may be included but must be mixed with sufficient earth to fill all voids.

1.16 SLEEVES, CHASES AND OPENINGS

A. Sleeves shall be required at all points where exposed conduits pass through new concrete walls, slabs, or masonry walls. Sleeves that must be installed below grade or where subject to high water conditions must be installed watertight.

B. Wiring chases shall be provided where shown on the Contract Drawings. The Contractor shall have the option of installing chases below surface mounted panel boards provided all structural requirements are met.

C. It is the Contractor's responsibility to leave openings to allow installation of the complete, operational electrical system. Openings required but not left shall be cut as outlined under cutting and patching. The Contractor shall coordinate all holes and other openings with necessary diameters for proper fire stopping.

1.17 POWER COMPANY COORDINATION

A. The Contractor is responsible for coordinating all activities onsite by American Electric Power (AEP).

B. All power company metering equipment shall be electrically located "upstream" of any manual/automatic transfer equipment.

C. Any special provisions required by the serving electrical utility shall be as outlined on the Contract Drawings or as advised by the utility at the time of construction, and work required by these special provisions shall be executed with no extra cost to the Owner.

1.18 TEMPORARY ELECTRICAL POWER

A. The Contractor shall be responsible for providing temporary electrical power as required during construction and shall remove the temporary service equipment when no longer required. Temporary power is also addressed in Division 01.

1.19 OVERCURRENT PROTECTION

A. Circuit breakers or fused switches shall be the size and type as written herein and shown on the Contract Drawings. Any additional overcurrent protection required to maintain an equipment listing by an authority having jurisdiction shall be installed by the Contractor at no extra cost to the Owner.

B. The Contractor shall submit to the Engineer actual nameplate data from motors shipped to the site, stating motor identification as well as characteristics. Overload relay thermal unit selection tables shall accompany the motor data. The Engineer will select thermal unit sizes from this data for use by the Contractor in ordering proper thermal units.

1.20 TRAINING

A. All manufacturers supplying equipment for this division shall provide the Owner's operations staff with training in the operation and maintenance on the equipment being furnished. The training shall be conducted at the project site by a qualified representative of the manufacturer.

B. The cost of this training shall be included in the bid price.

C. The required training shall consist of both classroom and hands-on situation. Classroom training shall include instruction on how the equipment works its relationship to all accessories and other related units, detailed review of shop drawings, detailed presentation of written O & M instructions, troubleshooting and record-keeping recommendations. Hands-on-training shall include a review of the manufacturer's O & M instructions, check out of each operator to identifying key elements of the equipment, tear down as appropriate, calibration, adjustment, greasing and oiling points, and operating manipulations of all electrical and mechanical controls.

D. The training shall be scheduled through the Contractor with the Owner. The timing of the training shall closely coincide with startup of the equipment, but no training shall be conducted until the equipment is operational.

E. The minimum number of hours to be provided by manufacturers supplying equipment on this project shall be in accordance with the following table:

	Training Hours	
Item	Classroom	Hands-on
Standby Power System & Accessories	2	2
Lighting Control Systems and Devices	2	2

F. At least 60 days prior to the training the manufacturer shall submit through the Contractor to the Engineer an outline of the training proposed for the Engineer's review and concurrence.

G. The Owner reserves the right to videotape all training sessions.

1.21 AS BUILT DRAWINGS

A. The Contractor shall always maintain 1 set of the Contract Drawings on the job in good condition for examination. The Contractor's qualified representative shall enter upon these drawings, from day to day, the actual "as-built" record of construction

and/or alteration progress. Entries and notes shall be made in a neat and legible manner and these drawings delivered to the Engineer after completion of the construction, for use in preparation of Record Drawings.

1.22 MAINTAINING CONTINUOUS ELECTRICAL SYSTEM AND SERVICE

A. Existing service(s) continuity shall be always maintained. In no way shall the installation and/or alteration of the electrical work interfere with or stop the normal operation of the existing facilities, except where prior arrangements have been made

B. When additions and taps to existing service(s) require electrical outages of any duration, arrangements shall be made in advance for such outages. All outages shall be held to an acceptable minimum with none exceeding 8 hours continuous duration. If necessary, cuts shall be performed on premium time. If performed at night, requiring a general outage, the Contractor shall furnish an auxiliary source of light and power as required. Under no circumstances shall an electrical outage of any duration be initiated until the Owner and Engineer have concurred, and as far as possible in advance.

1.23 GROUNDING AND BONDING

A. All metallic conduit, cabinets, equipment, and service shall be grounded in accordance with the latest issue of the National Electrical Code. All supporting framework and other metal or metal clad equipment or materials which are in contact with electrical conduit, cable and/or enclosures shall be properly grounded to meet the code requirements.

1.24 RELATED SPECIFICATION DIVISIONS

A. The following divisions contain Specifications on utilization equipment, equipment accessories, and procedures related to execution of the electrical work, and are included here for the Contractor's information. Bids shall still be based on complete Contract Documents.

Division 00 – Procurement and Contracting Requirements
Division 01 – General Requirements
Division 02 – Existing Conditions
Division 03 – Concrete
Division 05 – Metals
Division 08 – Openings
Division 09 – Finishes
Division 10 – Specialties
Division 11 – Equipment
Division 13 – Special Construction
Division 23 – Heating, Ventilating, and Air Conditioning
Division 27 – Communications
Division 28 – Electronic Safety and Security
Division 31 – Earthwork
Division 33 – Utilities

1.25 SERVICE ENTRANCE

A. Conductors and terminations for service entrances shall be furnished and installed by the Contractor. Voltage, phase, and number of wires shall be as shown on the Drawings.

B. Any details not shown on the Drawings or written in the Specifications pertaining to the service entrance shall be per power company requirements. It is the Contractor's responsibility to contact the utility prior to bidding and obtain any special requirements or costs they will be imposing. Those costs shall be included in the bid.

C. On underground service entrances from pad mounted transformers, the Contractor shall be responsible for furnishing and installing all primary, secondary, and metering conduits, as well as secondary service/metering conductors. The Contractor shall be responsible for furnishing pull wires in primary conduits for use by the power company. The Contractor shall be responsible for fabricating the required concrete pad that the transformer will be mounted on. The Contractor shall also mount the meter base furnished by the power company.

1.26 CONTRACTOR LICENSING

A. The Contractor performing the electrical work on this project shall be locally licensed, if required by local law or ordinance. If the Contractor has passed the State test, it may not be necessary to meet local testing requirements. It shall be the Contractor's responsibility to investigate these requirements and comply with same.

1.27 ANCHORING/MOUNTING

A. Electrical conduits and/or equipment shall be rigidly supported. Anchors used shall be metallic expansion type, or if appropriate to prevent spalling concrete, epoxy set type. Plastic or explosive type anchors are prohibited.

1.28 ELECTRICAL COMPONENT MOUNTING HEIGHTS

A. Unless otherwise indicated, mounting height for components shall be as defined herein. In cases of conflicts with architectural or structural aspects, the components may be relocated. If an indicated height conflicts with a code requirement, the code shall govern.

B. Mounting heights are given from finished floor elevation to the centerline of the component, unless otherwise noted.

	Component	Height	Comments
1.	Wall type light switch	4'-0"	To top of box
2.	Low wall outlet box	16"	To bottom
3.	Medium height wall outlet box	44"	To bottom

	Component	Height	Comments
4.	Wall type buzzers, horns, etc.	8'-0" Max.	Top 2" below ceiling
5.	Wall type exit signs	8'-0" Max.	Top of sign 2" below ceiling
6.	Wall mount speaker	8'-0" Max.	Top of speaker 1" below ceiling
7.	Wall mount stair landing light	7'-6"	To bottom
8.	Push-button or control stations	4'-0"	
9.	Top of panelboards or control panels	6'-6"	Maximum
10.	Top of telephone back boards	8'-6"	Maximum
11.	Top of switch handle on motor control center	6'-6"	Maximum
12.	Top of local motor controller	6'-0"	Maximum
13.	Top of local disconnect switch	6'-0"	Maximum
14.	Wall mounted outlets above a counter	2"	Above countertop or backsplash
15.	Wall outlets over workbench	3'-6"	Coordinate with workbench
16.	Wall mount exterior light fixtures	8'-0"	Except as noted on Drawings
17.	Wall mount emergency light fixtures	6'-6"	Maximum to test button
18.	Wall thermostats outlet box	4'-0"	Per Division 23
19.	Receptacles & cable outlet box for wall hung TV	72"	
20.	Fire alarm manual pull station outlet box	42”	To the handle
21.	Fire alarm horn/strobe outlet box	80"	Max. 6" below ceiling whichever is lower

In situations where there appears to be a conflict with Americans with Disabilities Act (ADA) legislation, utilize the ADA requirements.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION 260000

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Alpha Wire Company.
2. Belden Inc.
3. Cerro Wire LLC.
4. Cooper Industries, Inc.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. General Cable; General Cable Corporation.
8. Senator Wire & Cable Company.
9. Service Wire Co.
10. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2 and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type SO with ground wire.

E. VFC Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. AFC Cable Systems; a part of Atkore International.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. Ideal Industries, Inc.
6. ILSCO.
7. O-Z/Gedney; a brand of Emerson Industrial Automation.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

E. VFC Output Circuits: Type XHHW-2 in metal conduit with braided shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017839 "Project Record Documents," include the following:

a. Instructions for periodic testing and inspection of grounding features at test wells ground rings, grounding connections for separately derived systems based on NETA MTS.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.
11. Thomas & Betts Corporation, A Member of the ABB Group.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers: As a minimum, install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation. Coordinate with Frankfort Plant Board Electric for exact requirements.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For generator grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260533 " Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts (Data Center Only): Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Ground resistance shall be 5 ohms. Report measured ground resistances that exceed that value.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Seismic mitigation controls for sensitive areas shall be signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Allied Tube & Conduit; a part of Atkore International.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. Flex-Strut Inc.
e. GS Metals Corp.
f. G-Strut.
g. Haydon Corporation.
h. Metal Ties Innovation.
i. Thomas & Betts Corporation, A Member of the ABB Group.
j. Unistrut; an Atkore International company.

k. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Hilti, Inc.
      2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti, Inc.
      4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inchand smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099600 "Exterior Painting" and Section 099000 Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

B. Related Sections include the following:

1. Division 27 Communications

2. Division 28 Electronics Safety and Security

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. GRC: Galvanized rigid steel conduit.

C. FMC: Flexible metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. GRC: ANSI C80.1.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel or aluminum.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Concrete tight and rain tight, with connectors having insulated throats. Steel gland and ring compression type for conduit sizes 2 inches and smaller. Use steel set screw type with four set screws for conduit sizes over 2 inches. Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.

G. Joint Compound for GRC: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Type EPC- 40 or 80-PVC, unless otherwise indicated.

C. Fittings for RNC: NEMA TC 3; match to conduit type and material.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: Hinged type.

F. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC" or "COMMMUNICATIONS" as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product by Quazite or a comparable product by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC- 40-PVC or EPC-80-PVC, as indicated on drawings, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:

a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Polymer-concrete units, structurally tested according to SCTE 77 with 3000-lbfvertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Includes raceways in the following locations:

a. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size for electrical power systems and 1-inch trade size for all communication system cabling.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid: Use threaded rigid steel conduit fittings, unless otherwise indicated.

E. Stub-ups to Above Recessed Ceilings:

1. Use EMT for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

3.2 BOX APPLICATION

A. All outlet boxes shall be at least 1-3/4 inches deep, single or gang type of size to accommodate devices shown.

B. Outlet boxes for masonry construction shall not be less than 2-1/2 inches deep for 4-inch block and 3-1/2 inches for 6- and 8-inch block.

C. All communications and AV outlet boxes shall be 4-inch square type, 2-1/2 inches deep with single gang tile cover of suitable depth for flush installation in masonry walls.

D. Ceiling outlets shall be 4-inch octagon or 4-inch square, minimum 2-1/8 inch deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans. All ceiling outlets shall be equipped with 3/8-inch fixture studs.

E. Coordinate masonry cutting to achieve neat openings for boxes.

3.3 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Section 260529 "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inchtrade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from RNC to GRC before rising above floor.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inches of slack at each end of pull wire.

M. Expansion-Joint Fittings: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
    d. Mezzanine: 135 deg F temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

N. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

Q. All open conduit work through new walls or slabs shall be run through sleeves that shall be made watertight.

R. Where GRS conduit penetrates a floor slab the conduit shall be painted with 2 coats of Koppers Bitumastic 300-M or equal to a point 6 inches above the penetration.

S. All underground conduits entering a building shall be sealed against water/condensate entering around the conductors. Sealant may be silicone rubber-based caulk.

T. All conduits for emergency lighting systems shall be separate from other building power conduits.

U. Provide 1-inch conduit from each communications television outlet box to above ceiling and stub-out. Division 27 Contractors shall provide bridle rings for cable routing from end of conduit stub-outs to cable tray or headend equipment. Where cable must pass through a wall, provide 4-inch conduit sleeve for cable passage. Ends of all conduits shall be provided with insulated bushing for cable protection.

3.4 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment

pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. Warning Tape: Bury warning tape as indicated on contract drawings or as required by Utility Company.

B. Underground raceways (conduit) shall be provided with steel sleeves or concrete encasement where they pass over or under obstructions, such as: sidewalks; roadways; piping; etc.

3.5 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inchsieve to No. 4sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes and boxes with bottom below the frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Advance Products & Systems, Inc.
    b. CALPICO, Inc.
    c. Metraflex Company (The).
    d. Pipeline Seal and Insulator, Inc.
    e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.4 FLOOR MARKING TAPE

A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

1. Overall Thickness: 5 mils.
2. Foil Core Thickness: 0.35 mil.
3. Weight: 28 lb/1000 sq. ft..
4. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
3. High Voltage Warning: “DANGER – HIGH VOLTAGE – ELECTRICAL ROOM”.

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label (Indoor): Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay (Outdoor): Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.9 CABLE TIES

A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. Indoors: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with orange self-adhesive vinyl label.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchboards.
    e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    f. Emergency system boxes and enclosures.
    g. Enclosed switches.
    h. Enclosed circuit breakers.
    i. Enclosed controllers.
    j. Variable-speed controllers.

k. Push-button stations.
l. Power transfer equipment.
m. Contactors.
n. Remote-controlled switches, dimmer modules, and control devices.
o. Monitoring and control equipment.
p. UPS equipment.

END OF SECTION 260553

SECTION 260572 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
    b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Short-Circuit Study Specialist.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchboard and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Calculated asymmetrical fault currents:

        1) Based on fault-point X/R ratio.
        2) Based on calculated symmetrical value multiplied by 1.6.
        3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.
    e. Equivalent impedance.
    f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

2.3 MAXIMUM AVAILABLE FAULT-CURRENT LABEL

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch minimum thermal transfer label of high-adhesion polyester.

B. Furnish and install a maximum available fault current sign with date calculated on the building main service device per NEC Article 110.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Low-voltage switchboard.

3. Control panels.
4. Standby generators and automatic transfer switches.
5. Branch circuit panelboards.
6. Disconnect switches.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION 260572

SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect

for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Coordination Study Specialist.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017839 "Project Record Documents," include the following:

a. The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.
2) Protective device coordination study.
3) Time-current coordination curves.

b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by one of the following:

1. ESA Inc.
2. Operation Technology, Inc.
3. Power Analytics, Corporation.
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

   a. Phase and Ground Relays:

      1) Device tag.
      2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
      3) Recommendations on improved relaying systems, if applicable.

   b. Circuit Breakers:

      1) Adjustable pickups and time delays (long time, short time, ground).
      2) Adjustable time-current characteristic.
      3) Adjustable instantaneous pickup.
      4) Recommendations on improved trip systems, if applicable.

   c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

   a. Power utility's overcurrent protective device.
   b. Medium-voltage equipment overcurrent relays.
   c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
   d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
   e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
   f. Cables and conductors damage curves.
   g. Ground-fault protective devices.
   h. Motor-starting characteristics and motor damage points.
   i. Generator short-circuit decrement curve and generator damage point.
   j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Provide adequate time margins between device characteristics such that selective operation is achieved.

6. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

K. The calculations shall include the ac fault-current decay from induction motors and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.
2. Low-voltage switchboard.
3. Standby generators and automatic transfer switches.
4. Branch circuit panelboards.
5. Disconnect switches.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchboard and panelboard bus bars to withstand short-circuit stresses.
3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

3.3 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:

1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.4 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of the motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141, and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.5 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).

16. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards ampacity, and SCCR in amperes rms symmetrical.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.

2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 260573

SECTION 260574 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Specialist.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017839 "Project Record Documents," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by one of the following:

1. ESA Inc.
2. Operation Technology, Inc.

3. Power Analytics, Corporation.
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis, and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchboard and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.

4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

F. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

G. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

H. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and

shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply one arc-flash label for 480-V ac and applicable 208-V ac panelboards and disconnects and for each of the following locations:

1. Motor-control center.
2. Low-voltage switchboard.
3. Control panel.

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 260574

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following lighting control devices:
   1. Outdoor Photoelectric switches.
   2. Indoor occupancy sensors.

B. Related Requirements:

   1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Intermatic, Inc.
2. Paragon Electric Co.; Invensys Climate Controls.
3. Lithonia Lighting; Acuity Lighting Group, Inc.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.2 INDOOR OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products as manufactured by Watt Stopper or a comparable product by one of the following:

1. Hubbell Control Solutions (NX Distributed Intelligence)
2. Acuity Controls (nLight)

B. General Description: Ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights ‘on’ manually with local LV switch and turn lights ‘off’ manually with local LV switch or when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 5 to 30 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

a. Sensor: Suitable for mounting in any position on a standard outlet box.
b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Low-Voltage Ceiling Sensor (360°)

   a. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.
   b. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur to activate lighting systems. Upon verification, detection by either shall hold lighting on.
   c. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off.
   d. Sensors shall be ceiling mounted with a flat, unobtrusive appearance and provide 360° coverage.
   e. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing that automatically adjusts the detection threshold dynamically to compensate for changing levels of activity and airflow throughout controlled space.
   f. To avoid false ON activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.
   g. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.
   h. Sensors shall operate at 24 VDC/VAC and halfwave rectified and utilize a power pack.
   i. Sensors shall have a time delay that is adjusted automatically shall have a fixed time delay of 5 to 30 minutes, set by DIP switch.
   j. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.
   k. Sensors shall have a manual on function that is facilitated by installing a momentary switch.
   l. Sensors shall have eight occupancy logic options that give the ability to customize control to meet application needs.
   m. The sensors shall feature terminal style wiring, which makes installation easier.
   n. Sensor shall have an additional single-pole, double throw isolated relay with normally open, normally closed, and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options.

o. Each sensing technology shall have an LED indicator that always remains active to verify detection within the area to be controlled. The LED can be disabled for applications that require less sensor visibility.
p. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
q. Sensors shall have standard 5-year warranty and shall be UL and CUL listed.
r. Sensor to be Hubbell OMDT2 or equal.

D. Power Packs

1. Power pack shall be a self-contained transformer and relay module measuring 1.6" x 2.75" x 1.6".
2. For ease and speed of installation, power and auxiliary relay pack shall have 1/2" snap-in nipple for 1/2" knockouts and mounting on outside of enclosure.
3. Power packs shall have dry contacts capable of switching 277 VAC, 20-amp ballast load.
4. Power packs shall provide a 24 VDC, 150 mA output.
5. Power packs shall be capable of parallel wiring without regard to AC phases on primary.
6. Power pack can be used as a stand alone, low voltage switch, or can be wired to sensor for auto control.
7. Power packs shall have low voltage Teflon coated leads, rated for 300 volts, suitable for use in plenum applications.
8. To ensure quality and reliability, power and auxiliary relay packs shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
9. Power packs shall have a 5-year warranty.
10. Power packs shall be UL and CUL listed.
11. Single-pole, two-pole, and dimming power packs to be Hubbell NXRC-1R-UNV, NXRC-2R-UNV, and NXRC-1RD-UNV, respectively.

2.3 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transformers, accessories, and components, from manufacturer.

B. Qualification Data: For testing agency.

C. Source quality-control reports.

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Schneider Electric USA, Inc.
4. Siemens Industry, Inc.
5. Square D.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.

1. Coil Material: Copper

D. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated.

1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.

D. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

E. Taps for Transformers 3 kVA and Smaller: One 5 percent tap above normal full capacity.

F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above, and one 5 percent tap below normal full capacity.

G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

H. Insulation Class, 220 deg C, UL-component-recognized insulation system with a maximum of 150-deg C rise above 40-deg C ambient temperature.

I. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.

J. Wall brackets and structure hanging supports shall be fabricated from design drawings signed and sealed by a licensed structural engineer.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

B. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Install wall-mounted transformers level and plumb with wall brackets fabricated from design drawings signed and sealed by a licensed structural engineer.

1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

E. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

F. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

G. Secure transformer to concrete base according to manufacturer's written instructions.

H. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

I. Remove shipping bolts, blocking, and wedges.

3.2 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.

B. Remove and replace units that do not pass tests or inspections and retest as specified above.

C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.

2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

3.4 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for SPD as installed in panelboard.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Key interlock scheme drawing and sequence of operations.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

E. Incoming Mains Location: Top or Bottom, as required.

F. Phase, Neutral, and Ground Buses: Tin-plated aluminum.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. Square D; Schneider Electric.
3. General Electric Company; GE Energy Management – Electrical Distribution.
4. Siemens Energy.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker or lugs only, as identified on drawings.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. Square D; Schneider Electric.
3. General Electric Company; GE Energy Management – Electrical Distribution.
4. Siemens Energy.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only, as indicated on drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. Square D; Schneider Electric.
3. General Electric Company; GE Energy Management – Electrical Distribution.
4. Siemens Energy.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
3. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NEMA PB 1.1.

C. Mount top of trim 78 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

H. Install filler plates in unused spaces.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Snap switches.
4. Pendant cord-connector devices.
5. Cord and plug sets.
6. Wall-box dimmers.
7. Wall-switch occupancy sensors.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

B. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide Hubbell No. 5362 or equal by Cooper, Leviton, or Pass & Seymour.

2.2 GFCI RECEPTACLES

A. General Description: Straight blade, feed-through, weather-resistant type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide Hubbell No. GFTR20 or equal by Cooper, Leviton, or Pass & Seymour.

2.3 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type, heavy-duty grade, plug and receptacle body connector; NEMA WD 6 receptacle and plug configurations as required to match voltage and current ratings and number of conductors of equipment being connected.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.

2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide Hubbell No. 1221 (single pole), 1222 (two pole), 1223 (three way), 1224 (four way) or equal by Cooper, Leviton, or Pass & Seymour.

2.6 WALL-BOX DIMMERS

A. Refer to project drawings for information.

2.7 WALL-SWITCH OCCUPANCY SENSORS

A. Refer to project drawings for information.

2.8 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished and Unfinished Spaces: Shall be of 302 stainless steel (nonmagnetic) with rounded or beveled edges,
3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant cast aluminum, while-in-use, locking type as manufactured by Hubbell, Cooper, Taymac Corporation, Intermatic Guardian Series, or equal.

2.9 FINISHES

A. Wiring Device Color: Grey, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Receptacles over workbenches or countertops or at medium or high mountings shall be mounted so that the grounding slot is below the neutral and hot. All other receptacles shall be mounted with the grounding slot above the neutral and hot.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped, or engraved machine printing with black-filled lettering on back of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Molded-case circuit breakers (MCCBs).
5. Molded-case switches.
6. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include wiring diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 240-V ac or 600-V ac, as indicated.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 240-V ac or 600-V ac (as indicated), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 140 deg F (60 deg C) rated wire on 125-A circuit breakers and below.

G. Standards: Comply with UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Long- and short-time pickup levels.
2. Long- and short-time time adjustments.
3. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

L. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) and brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel.

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 4X.
3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.2 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

F. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study".

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform tests and inspections.

D. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Verify correct phase barrier installation.
h. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

E. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect operating mechanism, contacts, and chutes in unsealed units.
g. Perform adjustments for final protective device settings in accordance with the coordination study.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 263213 - STANDBY POWER GENERATOR SYSTEMS - FIXED

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to install a fixed standby generator system, digital electronic controls, enclosed main circuit breaker, automatic transfer switch, and all other accessories as shown on the Contract Drawings and as specified herein.

B. Provide startup by a supplier authorized by the manufacturer, and on-site testing of the system.

C. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

D. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator set.

E. Transfer switches provided on this project without UL 3-cycle ratings as detailed in this specification will not be reviewed or approved.

1.2 SUBMITTALS

A. Engine-Generator submittals shall include the following information:

1. Factory published specification sheet.
2. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, control panel, enclosure, etc.
3. Dimensional elevation and layout drawings of the generator set enclosure and transfer switchgear and related accessories.
4. Weights of all equipment.
5. Concrete pad recommendation, layout, and stub-up locations of electrical and fuel systems.
6. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, control panel, and remote alarm indications.
7. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
8. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
9. Generator resistances, reactance’s, and time constants.
10. Generator locked rotor motor starting curves.

11. Manufacturer's documentation showing maximum expected transient voltage and frequency dips, and recovery time during operation of the generator set at the specified site conditions with the specified loads.
12. Manufacturer's and dealer's written warranty.

1.3 CODES AND STANDARDS

A. The generator set and its installation and on-site testing shall conform to the requirements of the following codes and standards:

1. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
2. IEEE587 for voltage surge resistance.
3. NEMA ICS10-1993 – AC Generator sets.
4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
5. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
6. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
7. UL2200. The genset shall be listed to UL2200 or submit to an independent third-party certification process to verify compliance as installed.
8. 40 CFR 60 – Subpart IIII: Standard of Performance for Stationary Compression Ignition Internal Combustion Engine

B. The Automatic Transfer Switch and controls shall conform to the requirements of the following:

1. UL 1008: Underwriters Laboratories Standard for Transfer Switch Equipment
2. NFPA 70 National Electrical Code
3. NFPA 99 Essential Electrical Systems for Health Care Facilities
4. NFPA 110 Standard for emergency and standby power systems
5. ANSI/IEEE 446 Recommended Practice for Emergency and Standby Power Systems for Commercial Applications
6. NEMA ICS 10 P1 Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment
7. IBC-2006 International Building Code-Seismic Certified
8. UL 508 Standard for Industrial Control

1.4 ACCEPTABLE MANUFACTURERS

A. The generator set shall be as manufactured by Caterpillar, Cummins, or Generac. Equipment specifications for this project are based on microprocessor-based generator sets manufactured by Caterpillar.

B. The automatic transfer switch as manufactured by generator set manufacturer. Transfer Switches shall be sized as shown on Electrical Riser Diagram.

1.5 TESTING

A. Generator Set

1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
2. Design Prototype Tests. Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:

    a. Maximum power (kW).
    b. Maximum motor starting (kVA) at 35% instantaneous voltage dip.
    c. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
    d. Governor speed regulation under steady-state and transient conditions.
    e. Voltage regulation and generator transient response.
    f. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
    g. Three-phase short circuit tests.
    h. Alternator cooling air flow.
    i. Torsional analysis to verify that the generator set is free of harmful torsional stresses.
    j. Endurance testing.

3. Final Production Tests. Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

    a. Single-step load pickup
    b. Safety shutdown device testing
    c. Rated Power @ 0.8 PF
    d. Maximum power
    e. Upon request, a witness test, or a certified test record sent prior to shipment.

B. Automatic Transfer Switch

1. After fabrication of the transfer switch in the manufacturer's plant, a high potential test shall be conducted in accordance with NEMA's requirements for 480/277 volts operation. In addition, an operating test shall be simulated to verify that all the equipment performs as described above. A certified test report shall be furnished by the manufacturer to show that the transfer switch meets all requirements of these Specifications and that the operational requirements have been met.

1.6 START-UP

A. Generator Set

1. Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

    a. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
    b. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
    c. Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
    d. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.
    e. At the time of startup, operating instruction and maintenance procedures shall be thoroughly explained to operating personnel. Installation, operating, and maintenance instruction books shall be submitted for each electric set and all auxiliary equipment in a 3-ring binder, at the time of submittal of descriptive literature, for review. The manufacturer’s service representative shall be prepared to check phase rotation “by instrument”, prior to start-up. It will not be allowed to isolate one motor on the generator and check its rotation to determine phasing.

B. Automatic Transfer Switch

1. After the installation is completed, the transfer switch shall be tested by simulating a power failure and having each unit automatically start, come up to speed, and assume the available load at the site. The alarm and shutdown features of each set shall be tested to make sure they are in proper working order. Any defects which become evident at this time shall be corrected before acceptance of the complete standby generating system by the Owner. The supplier shall specify the nearest location where parts and service will be available.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The generator set shall be a Caterpillar Model DG150-2, or approved equal, with a LC3134J Alternator. The generator set shall be Standby Duty rated at 150 kW, 187.5 kVA, 1800 RPM, 0.8 power factor, 480 V, 3-Phase, 60 hertz, including radiator fan and all parasitic loads. Generator set shall be sized to operate at the specified load at a maximum ambient of 77F (25.0C) and altitude of 500.0 feet (152.4 m).

B. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 676 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip i.e., engine, alternator, voltage regulator and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system. Sustained voltage dip data shall not be treated as equal.

C. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 ENGINE

A. The minimum 535-cubic-inch displacement engine shall deliver a minimum of 233 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:

1. Electronic isochronous governor capable of 0.25% steady-state frequency regulation.
2. 12-volt positive-engagement solenoid shift-starting motor.
3. 30-ampere automatic battery charging alternator with a solid-state voltage regulation.
4. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
5. Dry-type replaceable air cleaner elements for normal applications.
6. Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel.

B. The turbocharged, air-cooled engine shall be fueled by natural gas.

C. The engine shall have a minimum of 8 cylinders and be liquid cooled by Unit Mounted Radiator 122°F/50°C.

D. The engine shall be EPA certified from the factory.

2.3 ALTERNATOR

A. The alternator shall be salient-pole, brushless, 2/3-pitch, 12 lead with 4 bus bars, self-ventilated with drip-proof construction and amortisseur rotor windings and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446, and the varnish shall be a fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to Standby 130°C/40°C. The excitation system shall be of brushless construction controlled by a solid- state voltage regulator capable of maintaining voltage within ±0.25% at any constant load from 0% to 100% of rating. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability, and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

B. The alternator shall have a single maintenance-free bearing, designed for 40000-hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

C. The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

2.4 CONTROLLER

A. EMCP 4.2B Controller

1. The generator set controller shall meet NFPA 110 Level 1 requirements (1996 version) and shall include an integral alarm horn as required by NFPA.
2. The controller shall meet NFPA 99 and NEC requirements.
3. The controller shall be UL 508 listed.

B. Applicability

1. The controller shall support 12 or 24-volt starting systems.
2. The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
3. The controller shall mount on the generator or remotely within 40 feet with viewable access.

C. Hardware Requirements

1. Control Panel shall include:

a. The control shall have a run-off/reset-auto three-position selector switch.
b. A controller-mounted, latch-type emergency-stop pushbutton
c. Five indicating lights: System Ready – green, Not in Auto – yellow, Programming Mode – yellow, System Warning – yellow, System Shutdown - red
d. Display with two lines of 20-alphanumeric characters, viewable in all light conditions.
e. Sixteen position snap action sealed keypad for menu selection and data entry.
f. For ease of use, an operating guide shall be printed on the controller faceplate.
g. An audible alarm with alarm silence capability.
h. Panel lights shall be supplied as standard.

D. Control Functional Requirements

1. Field-programmable time delay for engine start. Adjustment range 0-5 minutes in 1 second increments.
2. Field-programmable time delay engine cooldown. Adjustment range 0-10 minutes in 1 second increments.
3. Capability to start and run at user-adjustable idle speed during warmup for a selectable period (0-10 minutes), until engine reaches preprogrammed temperature, or as supported by ECM-equipped engine.
4. The idle function including engine cooldown at idle speed.
5. Real-time clock and calendar for time stamping of events.

6. Output with adjustable timer for an ether injection starting system. Adjustment range, 0-10 seconds.
7. Output for shedding of loads if the generator set reaches a user programmable percentage of its kW rating. Load shed shall also be enabled if the generator set output frequency falls below 59 Hz.
8. Programmable cyclic cranking that allows up to six crank cycles and up to 35 seconds of crank time per crank cycle.
9. The capability to reduce controller current battery draw, for applications where no continuous battery charging is available. The controller vacuum fluorescent display should turn off automatically after the controller is inactive for 5 minutes.
10. Control logic with alternator protection for overload and short circuit matched to each individual alternator and duty cycle.
11. Control logic with RMS digital voltage regulation. A separate voltage regulator is not acceptable. The digital voltage regulator shall be applicable to single- or three-phase systems.
12. The capability to exercise the generator set by programming a running time into the controller. This feature shall also be programmable through the PC software.
13. Control function shall include output voltage adjustment.
14. Battle switch function selection to override normal fault shutdowns, except emergency stop and overspeed shutdown.
15. The control shall detect the following conditions and display on control panel:

    a. Customer programmed digital auxiliary input ON (any of the 21 inputs available)
    b. Customer programmed analog auxiliary input out of bounds (any of 7 inputs for ECM equipped engines and 5 inputs for non-ECM engines)
    c. Emergency stop
    d. High coolant temperature
    e. High oil temperature
    f. Controller internal fault
    g. Locked rotor - fail to rotate
    h. Low coolant level
    i. Low oil pressure
    j. Master switch error
    k. NFPA common alarm
    l. Overcrank
    m. Overspeed with user-adjustable level, range 60-70 Hz.
    n. Overvoltage with user adjustable level, range 105% to 135%
    o. Overfrequency with user adjustable level, range 102% to 140%
    p. Underfrequency with user adjustable level, range 80% to 90%
    q. Undervoltage with user adjustable level, range 70% to 95%
    r. Coolant temperature signal loss
    s. Oil pressure gauge signal loss

    Conditions resulting in generator warning (generator will continue to operate):

    a. Battery charger failure
    b. Customer programmed digital auxiliary input on (any of the 21 inputs available)
    c. Customer programmed analog auxiliary input on (any of the 7 inputs available on ECM engines and 5 inputs for non-ECM engines)
    d. Power system supplying load
    e. Ground fault detected - detection by others
    f. High battery voltage - Level shall be user adjustable.

g. Range 29-33 volts for 24-volt systems.
h. High coolant temperature
i. Load shed
j. Loss of AC sensing
k. Underfrequency
l. Low battery voltage - level shall be user adjustable, range 20-25 volts for 24-volt systems.
m. Low coolant temperature
n. Low fuel level or pressure
o. Low oil pressure
p. NFPA common alarms
q. Overcurrent
r. Speed sensor fault
s. Weak battery
t. Alternator protection activated

E. Control Monitoring Requirements

1. All monitored functions must be viewable on the control panel display.
2. The following generator set functions shall be monitored:

a. All output voltages - single phase, three phase, line to line, and line to neutral, 0.25% accuracy
b. All single phase and three phase currents, 0.25% accuracy
c. Output frequency, 0.25% accuracy
d. Power factor by phase with leading/lagging indication
e. Total instantaneous kilowatt loading and kilowatts per phase, 0.5% accuracy
f. kVARS total and per phase, 0.5% accuracy
g. kVA total and per phase, 0.5% accuracy
h. kW hours
i. A display of percent generator set duty level (actual kW loading divided by the kW rating)

3. Engine parameters listed below shall be monitored: (*available with ECM equipped engines)

a. Coolant temperature both in English and metric units
b. Oil pressure in English and metric units
c. Battery voltage
d. RPM
e. Lube oil temperature*
f. Lube oil level*
g. Crankcase pressure*
h. Coolant level*
i. Coolant pressure*
j. Fuel pressure*
k. Fuel temperature*
l. Fuel rate*
m. Fuel used during the last run*
n. Ambient temperature*

4. Operational records shall be stored in the control beginning at system startup.

a. Run time hours

b. Run time loaded hours
c. Run time unloaded hours
d. Number of starts
e. Factory test date
f. Last run data including date, duration, and whether loaded or unloaded
g. Run time kilowatt hours

5. The following operational records shall be a resettable for maintenance purposes:

a. Run time hours
b. Run time loaded hours
c. Run time unloaded hours
d. Run time kilowatt hours
e. Days of operation
f. Number of starts
g. Start date after reset

6. The controller shall store the last one hundred generator set system events with date and time of the event.
7. For maintenance and service purposes, the controller shall store and display on demand the following information:

a. Manufacturer's model and serial number
b. Battery voltage
c. Generator set kilowatt rating
d. Rated current
e. System voltage
f. System frequency
g. Number of phases

F. Inputs and Outputs

1. Inputs

a. There shall be 21 dry contact inputs that can be user-configured to shut down the generator set or provide a warning.
b. There shall be 7 user-programmable analog inputs for ECM-equipped engines (5 for non-ECM engines) for monitoring and control.
c. Each analog input can accept 0–5-volt analog signals
d. Resolution shall be 1:10,000
e. Each input shall include range settings for 2 warnings and 2 shutdowns.
f. All values shall be on the control panel display.
g. Shall be user-assigned.
h. Additional standard inputs required:

1) Input for an external ground fault detector. Digital display shall show "ground fault" upon detection of a ground fault.
2) Reset of system faults.
3) Remote two-wire start.
4) Remote emergency stop.

i. Idle mode enable.

2. Outputs

    a. All NFPA 110 Level 1 outputs shall be available.
    b. Thirty outputs shall be available for interfacing to other equipment:

        1) All outputs shall be user-configurable from a list of 25 functions and faults.
        2) These outputs shall drive optional dry contacts.

    c. A programmable user-defined common fault output with over 40 selections shall be available.

G. Communications

1. If the generator set engine is equipped with an ECM (engine control module), the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards.
2. Industry standard Modbus communication shall be available.
3. A Modbus master shall be able to monitor and alter parameters and start or stop a generator.
4. The controller shall have the capability to communicate to a personal computer (IBM or compatible) running Windows '9X or Windows NT.
5. A variety of connections shall be available based on requirements:

    a. A single control connection to a PC.
    b. Multiple controls on an intranet network connected to a PC.
    c. A single control connection to a PC via phone line.
    d. Multiple controls to a PC via phone line.

6. Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same communication network.
7. The capability to connect up to 128 controls (any combination of generator sets and transfer switches) on a single network shall be supported.
8. Cabling shall not be limited to the controller location.
9. Network shall be self-powered.

2.5 ACCESSORIES

A. Battery Charger. A 10-ampere automatic float to equalize battery charger with the following features:

1. 12 or 24 VDC output
2. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations
3. Ammeter and voltmeter with 5% full-scale accuracy
4. LED lamp for power indication
5. Current limited during engine cranking, short circuit, and reverse polarity conditions
6. Temperature compensated for ambient temperatures for -40°C to 60°C
7. UL Listed

B. Battery Rack and Cables. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

C. Critical Silencer. The engine exhaust silencer shall be temperature and rust resistant and rated for critical applications. The silencer will reduce total engine exhaust noise by 25-35 db(A).

D. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition

E. Failure Relay.

1. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and overspeed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
2. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
3. Once energized the relay shall remain latched until the system is reset by the main controller switch.

F. Flex Exhaust Tube. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows with threaded NPT connection.

G. Run Relay. The run relay shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The relay provides three sets of dry contacts for energizing or deenergizing customer devices while the generator is running (e.g., louvers, indicator lamps, etc.)

H. Standard Air Cleaner. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

I. Block Heater. The block heater shall be thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

J. Load Center. The enclosure shall be equipped with a load center as a single-entry point for commercial power supply to support ancillary equipment. All equipment is to be prewired for the battery charger, jacket water heaters(s), lighting and convenience receptacle. The MLO load center shall be mounted within the enclosure and allow for site installed conduit entry. The placement of the load center and panel schedule shall be shown on the submittal drawings. All internal wiring shall be type THHN in EMT conduit in accordance with all governing codes pursuant to this application.

K. The generator set shall be provided with a mounted rated main line circuit breaker, sized to carry the rated output current of the generator set on a continuous basis. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided. An auxiliary contact shall be provided for remote monitoring of breaker position.

2.6 WEATHERPROOF ENCLOSURE

A. General:

1. Housing shall be designed and manufactured specifically for the application described in these specifications. Units must ship with the generator, vibration isolation, exhaust, and electrical components full installed and connected requiring no additional in-field modifications or assembly, except where specifically allowed by these specifications. The enclosure is to be accurately dimensioned to allow ample workspace to perform regular maintenance and inspections while maintaining compliance with clearances as defined by the National Electrical Code (NEC), and the National Fire Protection Association (NFPA). Include additional requirements of local authority having jurisdiction for installations of this type. It shall be the responsibility of the installing contractor to apply for and obtain necessary permits.

B. Construction:

1. The generator set enclosure shall be a factory assembled package constructed from a minimum of high strength, low alloy 14-gauge steel. The enclosure shall have a pitched enclosure roof to prevent water accumulation, and a radiator fill panel to provide easy service access to the radiator. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement.
2. The enclosure component and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electrocoat (e-coat) adhesion. All parts shall receive a 100% epoxy primer electrocoat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power ArmorTM industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.
3. The enclosure must surpass a 3,000-hour salt spray corrosion test per ASTM B-1117.
4. Enclosures will be finished in the manufacturer's standard color.
5. The enclosures shall allow the generator set to operate at full load in an ambient temperature of 40 - 50°C with no additional derating of the electrical output of the generator set.
6. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.
7. Doors shall be hinged with stainless steel lift off hinges, and hardware, and the doors shall be removable. Access doors shall be rubber sealed to prevent water intrusion and to minimize noise.
8. Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.
9. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.
10. The complete exhaust system shall be internal to the enclosure.
11. The critical silencer shall be fitted with a tailpipe and rain cap.

12. The generator set enclosure shall be furnished with the battery charger wired into the load center.
13. The generator set enclosure shall be furnished with the block heater wired into the load center.

C. Interior Mounted Silencer:

1. An interior mounted low profile, internally insulated exhaust silencer and flexible, stainless steel exhaust bellows properly sized shall be furnished and installed according to the manufacturer's recommendations by the enclosure manufacturer. The silencer shall be mounted such that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe sizes shall be sufficient to ensure that exhaust back pressure does not exceed the maximum limitations specified by the engine manufacturer.

D. Exhaust Outlet:

1. Each silencer shall be fitted with a tailpipe terminating in a vertical position and shall be fitted with a weighted rain cap. At the point where the exhaust pipe penetrates the roof of the enclosure provide a suitable rain skirt and collar. It shall be designed to prevent the entrance of rain yet allow for expansion and vibration of the exhaust piping without chafing or stress to the exhaust system or enclosure. The outlet extension may be removed for over the road transportation with a weather tight shipping cover. Site installation will be performed by the installing contractor.

E. Unitizing Sub Frame:

1. Subframe must be constructed out of structural steel. Subframe will have a floor of structural steel cross members fully welded to the outside rails. Cross members will serve as support for the compressor equipment. Top of subframe rails must serve as support for the Compressor enclosure. Subframe must have means of lifting with built in lift eyes. Subframe lift points must be rated to lift its own weight plus that of the compressor equipment and enclosure. For shipment, interior "D" rings must be installed for tying down and securing compressor equipment. Also, expansion bolts with sleeves must be installed between the enclosure and the housing to allow for movement during transport.

2.7 SEQUENCE OF OPERATION

A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control.

B. The generator set shall complete a time delay start period as programmed into the control.

C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:

1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control

system shall shut down and lock out the generator set and indicate “fail to crank” shutdown.

2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.
3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.

D. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.

E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.

F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.

1. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

G. LOAD SHED
1. ATS-1 is a life safety switch. ATS-2 is a non-essential equipment switch.
2. The generator set controller and ATS-2 shall be interconnected such that if the generator exceeds 90% of its nameplate rating for 3 seconds ATS-2 will be shed to preserve the integrity of the life safety loads.
3. Load shed set-point and time delay shall be field programmable.
4. Resetting of the load shed shall be accomplished manually by on-site personnel after equipment loads have been removed.7

2.8 AUTOMATIC TRANSFER SWITCH

A. Construction

1. General

a. Transfer switches shall be electrically operated and mechanically held with double throw construction.
b. On 3-phase, 4-wire systems, a true 4-pole switch shall be supplied with all four poles mounted on a common shaft. The continuous current rating and the closing and withstand rating of the fourth pole shall be identical to the rating of the main poles.
c. The transfer switch shall be mounted in a NEMA 1 enclosure, unless otherwise indicated. Enclosures shall be fabricated from 12-gauge steel. The enclosure shall be sized to exceed minimum wire bending space required by UL 1008.

d. The transfer switch shall be equipped with an internal welded steel pocket, housing an operations and maintenance manual.
e. The transfer switch shall be top and bottom accessible.
f. The main contacts shall be capable of being replaced without removing the main power cables.
g. The main contacts shall be visible for inspection without any major disassembly of the transfer switch.
h. All bolted bus connections shall have Belleville compression type washers.
i. When a solid neutral is required, a fully rated bus bar with required AL/CU neutral lugs shall be provided.
j. Control components and wiring shall be front accessible. All control wires shall be multiconductor 18 gauge 600-volt SIS switchboard type point to point harness. All control wire terminations shall be identified with tubular sleeve-type markers.
k. The switch shall be equipped with 90 degrees C rated copper/aluminum solderless mechanical type lugs.
l. The complete transfer switch assembly shall be factory tested to ensure proper operation and compliance with the specification requirements. A copy of the factory test report shall be available upon request.

2. Automatic Transfer Switch

a. The transfer switch shall be double throw, actuated by two electric operators momentarily energized, and connected to the transfer mechanism by a simple over center type linkage. Minimum transfer time shall be 400 milliseconds.
b. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in both the normal and emergency positions without the use of hooks, latches, magnets, or springs, and shall be silver-tungsten alloy. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches. Interlocked, molded case circuit breakers or contactors are not acceptable.
c. The transfer switch shall be equipped with a safe external manual operator, designed to prevent injury to operating personnel. The manual operator shall provide the same contact to contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly. The external manual operator shall be safely operated from outside of the transfer switch enclosure while the enclosure door is closed.

3. Transfer Switch Controller

a. The transfer switch shall be equipped with a Microprocessor Controller with a Power Supply Module, CPU and I/O Modules for all voltage and ampere ratings. The controller shall be capable of both Serial and Ethernet communications.
b. The controller shall contain voltage sensing modules capable of direct single phase or three phase sensing of each source from 120 VAC to 600 VAC. The Power Supply Module shall accept a 24 VDC external power source allowing controller communications in the event of a power outage.
c. Voltage sensing shall be true RMS type and accurate to +/- 1% of nominal voltage. Frequency sensing shall be accurate to +/- 0.05Hz. The operating temperature range shall be –20 to +50 degrees C and storage from –40 to +90 C.

d. The controller shall connect to the transfer switch through an interconnecting wiring harness. Interfacing relays shall be provided to isolate the controller from abnormal voltages applied to all customer input and output wiring terminals.
e. All customer interface connections shall be wired to a common DIN rail Cage Clamp terminal block. Sufficient space shall be provided to allow for future modifications and upgrades.
f. The controller shall meet or exceed the requirements for Electromagnetic Compatibility as follows

1) EN55022 (CISPR11) Conducted and Radiated emissions, Class B
2) EN61000-4-2 (Level 4) ESD immunity test
ENG6100-4-3 (ENV50140) Radiated RF
EN61000-4-4 Electrical fast transient/burst immunity test
EN61000-4-5 IEEE C62.41 Surge immunity test
EN61000-4-6 (ENV50141) Conducted immunity test
EN61000-4-11 Voltage dips and interruption immunity
3) IEEE 472 (ANSI C37.90A) Ring wave immunity

4. Controller Display and Keypad

a. A color, ¼ VGA minimum, graphical display shall be provided for viewing data and setting operational parameters. Parameters shall also be available for viewing remotely and limited control through a front accessible USB communications port.
b. The Controller shall provide high intensity LED's for the following:

1) Source Availability - Indicates the source voltage and frequency are within preset parameters.
2) Source Connected - Indicates the source main contacts closed and the load being served from the source.
3) XFER Inhibit - Indicates that the ATS is being inhibited from Automatic operation to the unconnected source.
4) Alarm – Indicates an alarm condition is active.
5) TD Active – Indicates that a transfer switch time delay is actively timing.
6) For ease of navigation, the display shall include the following:

a) Soft Keys – Change function based on user location in the menu structure.
b) Dedicated Navigational Keys – Home, Scroll Up, End, Escape and Enter.
c) Dedicated Pushbuttons for Alarm Reset, Test, Control, and Information.

B. Operation

1. Voltage, Frequency and Phase Rotation Sensing

a. Programmable voltage and frequency sensing of both sources capable of detecting single or three phase losses. The Controller shall have adjustable pickup and dropout settings for each source. Set point ranges as follows:

Setpoint Ranges			
Parameter	Sources	Dropout/Trip	Pickup/Reset
Undervoltage	N+E, 3-Phase	72 to 100%	70 to 98%
Overvoltage	N+E, 3-Phase	100 to 108%	102 to 110%
Underfrequency	N+E, 3-Phase	45.1 to 60.0 Hz	45.0 to 59.9 Hz
Overfrequency	N+E, 3-Phase	50.0 to 69.7 Hz	50.1 to 69.8 Hz

b. The controller shall monitor phase rotation of both sources and inhibit transfer if both sources are not the same phase rotation. (ABC or CBA)
c. Settings shall be adjustable in 1% increments either through the keypad, USB port or remotely via communications.
d. A single source status screen shall be provided to allow for viewing of the status of both sources including three phase voltage, power, and frequency.

2. Time Delays

a. The controller shall include an adjustable time delay of 0 to 10 seconds to momentarily override normal source power outages and to delay engine starting. The time delay shall be expandable up to 60 minutes if an external 24 VDC power supply is provided for ATS control.
b. The controller shall include an adjustable 0-to-60-minute time delay on transfer to emergency, factory set at 3 seconds.
c. The controller shall include a time delay on retransfer to the preferred source adjustable 0 to 259 minutes, factory set at 5 minutes.
d. The controller shall include a time delay on engine cool down adjustable 0 to 60 minutes, factory set at 5 minutes.
e. The controller shall include a timer to control the transition time from neutral to the non-preferred source, adjustable 0 to 10 minutes, factory set at 3 seconds.
f. The controller shall include a timer to control the transition time from neutral to the preferred source, adjustable 0 to 10 minutes, factory set at 3 seconds.
g. All time delays shall be adjustable in 1second increments. All time delays shall be adjustable via the graphical display, the front USB port or configuration software using the USB, serial, or Ethernet communications port.

3. Additional Features

a. Test Switch – The controller shall be provided with a two position, password protected, test switch to simulate a normal source failure. The test mode shall be configurable for Test Without Load or Test With Load functionality. The Test function shall be activated via the pushbutton on the display or remotely via a dry contact, voltage signal or a network signal.
b. Engine Start Signal – A SPDT contact, rated 10 amps at 30 VDC, shall be provided to start the engine generator in the event of a normal source outage.
c. Source connected contacts rated 10 amps at 120 VAC shall be provided to signal when the ATS is connected to each source.
d. Source Connected LED's – The controller shall include LED's to indicate when the ATS is connected to each source.

e. Source Availability LED's – The controller shall include LED's to indicate the availability of each source.

f. Commit/No-Commit Transfer Selector – The controller shall include a programmable selector to configure the controller to commit to transferring the load to emergency (or not) in the event the normal source returns prior to the generator being ready to accept load.

g. Inhibit Transfer Signals – The controller shall be capable of accepting transfer control inputs that inhibit transfer of the ATS to either source.

h. Auto/Manual Selector – The controller shall include a programmable function to select either Automatic or Manual operation.

i. ATS/Engine Exerciser – The controller shall include a user configurable exerciser.

j. Exerciser shall be configurable for daily, 7-day, 14 day or 28-day exercise period, each with (7) programmable events. The exerciser shall also be configurable as a full, 365-day exerciser with up to 24 independent exercise events. Each event shall be configurable for Test with Load and Test Without Load. Each event shall include user adjustable start time, date, and test duration. All time and date settings shall be stored in non-volatile EEPROM memory. The controller shall include full programmability for daylight savings time.

k. Diagnostics – The controller shall contain self and system diagnostic screens for the purpose of detecting and troubleshooting abnormal system events.

l. Communications Interface – The controller shall be capable of interfacing via serial/RS485 or optional Ethernet TCP/IP communications ports integral to the controller. All communications parameters (baud rate, parity, IP Address, etc.) shall be accessible and programmable via the front keypad. Both serial and Ethernet communication shall be Modbus open protocol.

m. Event Logger – The controller shall have the ability to log data and to maintain the last 256 events, even in the event of a power failure. Time and date stamping of events will be accurate to 1 ms. Controller shall be capable of synchronizing its date/time setting with a main PC via Network Time Protocol over an Ethernet TCP/IP network connection.

The following events shall be time and date stamped:

1) Last Primary Source Failure
2) Last reason for transfer.
3) Last transfer to alternate source
4) Last retransfer to primary source
5) Time load is without power
6) Time ATS powered up
7) Total time on source 1
8) Total time on source 2
9) Total number of primary source failures
10) Total number of transfers

n. Communications Modules

1) Serial Communications: Controller shall support RS485 communications port to enable serial communications at baud rates up to and including 115.2Kbps and be user configurable. The serial communications shall be capable of a direct connect or multi-drop configured network.

2) Ethernet Communications: Controller shall be capable of supporting an optional Ethernet TCP/IP communication via an internally mounted and self-powered communications card. Ethernet shall be 10/100 Mbit, auto sensing and include a RJ45 network connector.
3) Open Protocol: Both serial and Ethernet communications shall be Modbus protocol. Proprietary communications protocols shall not be acceptable.

o. External Power Supply: The controller shall be capable of being connected to an external 24 VDC power supply to permit full operation and communications of the controller when both sources are denergized.
p. Auto Load Shed: The controller shall be capable of being programmed to automatically shed the connected load in the event of a user configurable under frequency condition.
q. Customer Configurable Alarms – The controller shall be capable of being configured to display customer configured alarm points. Alarms shall be capable of being reset via a remote contact or the front panel RESET pushbutton.

C. Additional Requirements

1. Withstand and Close Ratings

a. The ATS shall be UL listed in accordance with UL 1008 for 3 cycle close and withstand ratings. ATSs that are not tested and labeled for 3 cycle ratings are not acceptable. Minimum UL listed close and withstand ratings at 480 VAC shall be as follows:

RMS Symmetrical Amperes @ 480 VAC		
Amperes	3 Cycle Closing & Withstand	Current Limiting Fuses
100 – 400	42,000	200,000
600 – 800	65,000	200,000
1000 – 1200	85,000	200,000
1600 – 3000	100,000	200,000
4000	125,000	200,000

b. During 3 cycle closing and withstand tests, there shall be no contact welding or damage. The 3-cycle test shall be performed without the use of current limiting fuses. The tests shall verify that contact separation has not occurred, and there is contact continuity across all phases. Test procedures shall be done in accordance with UL-1008, and testing shall be certified by Underwriters Laboratories, Inc.
c. When conducting temperature rise tests to UL-1008, the manufacturer shall include post-endurance temperature rise tests to verify the ability of the ATS to carry full rated current after completing the overload and endurance tests.

PART 3 - OTHER REQUIREMENTS

3.1 INSTALLATION

A. Equipment shall be installed by the Contractor in accordance with final submittals and Contract Documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site. The Contractor shall verify the actual pad dimension required per the accepted Shop Drawing prior to forming pad or pouring concrete. Any changes to the pad size to meet the above requirement shall be made at the Contractors expense. It is the Contractors responsibility to provide a pad to meet the dimensions of the generator set provided.

D. Equipment shall be initially started and operated by representatives of the manufacturer.

E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

F. Contractor shall furnish and install a platform/stair at the generator control panel and circuit breaker cabinet. Coordinate required dimensions of control platform with approved generator set. See Contract Drawings for control platform/stair requirements.

G. Provide required access and working space for automatic transfer switch as indicated or required by manufacturer.

H. Contractor shall contact the AHJ and fill out a permit application to install an aboveground fuel storage tank (generator sub-base fuel tank). Contractor shall be responsible for permit costs and shall coordinate inspection by the AHJ.

I. Contractor shall contact the Energy and Environment Cabinet Department for Environment Protection – Division for Air Quality and fill out a permit application to install a natural gas engine-driven emergency generator set. Contractor shall be responsible for permit costs.

3.2 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of

the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two-hour full load test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

3.3 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 2 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.4 SERVICE AND SUPPORT

A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

3.5 WARRANTY

A. The generator set shall be warranted for a period of not less than 5 years from the date of substantial completion against defects in materials and workmanship.

B. The warranty shall be comprehensive and shall cover all factory installed components not classified as “consumables”. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The automatic transfer switch shall be provided with a five-year warranty covering all parts, labor, and expenses during the first two years followed by three years of replacement parts coverage. Warranty shall not be dependent upon customer purchase of additional equipment or PM contracts.

3.6 TOOLS AND SPARE PARTS

A. An adequate supply of the proper lubricants shall be provided to perform one oil change and engine service interval. In addition, spare elements shall be provided for one change of fuel, and air filters.

B. Any special tools required for normal operation and maintenance shall be furnished to the Owner by the equipment manufacturer.

C. Provide an appropriate size and type fire extinguisher at each location where fuel is stored or used in accordance with the Building Code.

END OF SECTION 263213

SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:

1. Section 262416 “Panelboards”

1.3 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies Inc. (APT).
2. Atlantic Scientific.
3. Current Technology Inc.
4. Eaton Electrical Sector; Eaton Corporation.
5. LEA International.
6. Liebert; a brand of Emerson Electric Co.
7. Schneider Electric USA, Inc.
8. Siemens Industry, Inc.
9. Square D; by Schneider Electric.

B. SPDs: Comply with UL 1449, Type 2.

C. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
e. Surge counter.

D. Comply with UL 1283.

E. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating shall not be less than 200 kA per mode. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in each mode.

F. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

G. SCCR: Equal or exceed 200 kA.

H. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies Inc. (APT).
2. Atlantic Scientific.
3. Current Technology Inc.
4. Eaton Electrical Sector; Eaton Corporation.
5. LEA International.
6. Liebert; a brand of Emerson Electric Co.
7. Schneider Electric USA, Inc.
8. Siemens Industry, Inc.
9. Square D; by Schneider Electric.

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating shall not be less than 100 kA per mode. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in each mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V or 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V.
3. Neutral to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V.
4. Line to Line: 2000 V for 480Y/277 V or 1200 V for 208Y/120 V

F. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.
4. Line to Line: 1200 V.

G. SCCR: Equal or exceed 100 kA.

H. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by

manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

SECTION 265119 – LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, LED lamps, and LED drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Lumen: Measured output of lamp and luminaire, or both.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for LED lamps.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each

lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

D. Color Samples for each type of fixture requiring Architect selected finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

B. Product Certificates: For each type of driver dimmer-controlled fixtures, from manufacturer.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the Luminaires for a period of 5 years after acceptance of the Luminaires. Warranty shall cover all components comprising the luminaire. All warranty documentation shall be provided to customer prior to the first shipment.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Base Bid Manufacturers: Are listed on fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.

C. Each luminaire shall be designed to operate at an average operating temperature of 25°C.

D. Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average operating temperature.

E. The operating temperature range shall be 0°C to +25°C.

F. Metal Parts: Free of burrs and sharp corners and edges.

G. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

H. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

I. Diffusers:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
    b. UV stabilized.

J. Luminaire Construction:

1. Luminaire housing to have no visible welding, screws, springs, hooks, rivets, bare LED's, or plastic supports.
2. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.

2.3 LED LUMINAIRES

A. LED Lamps

1. LED's shall be manufactured by Nichia, Samsung, Osram or equal.

    a. Lumen Output – minimum initial lumen output of each luminaire shall be as specified in light fixture schedule.

2. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.
3. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
4. LED Boards shall be suitable for field maintenance or service from below the ceiling with plug-in connectors. LED boards shall be upgradable.
5. Light Color/Quality

    a. Correlated Color temperature (CCT) shall be 4100K, unless otherwise indicated.
    b. The color rendition index (CRI) shall be 80 or greater.
    c. Color shift over 6,000 hours shall be <0.007 change in u' v' as demonstrated in IES LM80 report.

B. Drivers

1. Acceptable manufacturers: eldoLED, Sylvania, or Philips that meet or exceed the criteria herein.
2. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
3. Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 5% of rated lumen output with a smooth shut off function.
4. Dimming shall be controlled by a 0-10V signal.
5. Driver shall be UL listed.
6. Maximum stand-by power shall be 1 Watt.
7. Driver disconnect shall be provided where required to comply with codes. The electronics/power supply enclosure shall be internal to the luminaire and be accessible per UL requirements.
8. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.

C. Electrical

1. Operation Voltage - The luminaire shall operate from a 50 or 60 HZ ±3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
2. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
3. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent at any standard input voltage.
4. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference.
5. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.
6. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.
7. All electrical components shall be RoHS compliant.

D. Photometric Requirements

1. Luminaire performance shall be tested as described herein.

    a. Luminaire performance shall be judged against the specified minimum illuminance in the specified pattern for a particular application.
    b. Luminaire lighting performance shall be adjusted (depreciated) for the minimum life expectancy.
    c. The performance shall be adjusted (depreciated) by using the LED manufacturer's data or the data from the IESNA Standard TM-21 test report, which ever one results in a higher level of lumen depreciation.

2. The luminaire may be determined to be compliant photometrically, if the initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern
3. The measurements shall be calibrated to standard photopic calibrations.

E. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
2. The LED manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient.
3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient.
4. The luminaire shall have an UL IC rating.
5. The Driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

2.4 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports, and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by driver manufacturer. Verify, with driver manufacturers, maximum distance between driver and luminaire.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Transfer Relays: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to emergency power and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

END OF SECTION 265100

SECTION 265613 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Poles and accessories for support of luminaires.

1.3 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete luminaire.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device, arranged as indicated.

1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
2. Include finishes for lighting poles and luminaire-supporting devices.
3. Anchor bolts.
4. Manufactured pole foundations.

B. Sustainable Design Submittals:

1. Product Certificates: For materials manufactured within 100 miles (160 km) of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
2. Chain-of-Custody Qualification Data: For manufacturer and vendor.

C. Shop Drawings:

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of poles and pole accessories.
4. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
6. Method and procedure of pole installation. Include manufacturer's written installations.

1.5 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For poles to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017839 "Project Record Documents," include pole inspection and repair procedures.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.9 WARRANTY

A. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-6-M.

B. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.

C. Live Load: Single load of 500 lbf (2200 N) distributed according to AASHTO LTS-6-M.

D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M. See structural drawings for requirements.

E. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.

F. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 STEEL POLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated or a comparable product.

B. Source Limitations: Obtain poles from single manufacturer or producer.

C. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.

D. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.

1. Shape: As indicated in Light Fixture schedule in drawings.
2. Mounting Provisions: Butt flange for bolted mounting on foundation.

E. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with galvanized-steel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.

F. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

G. Fasteners: Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot dip galvanized after fabrication unless otherwise indicated.

H. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

I. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.

J. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.

    a. Color: As indicated in Light Fixture schedule in drawings.

K. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder Coat: Comply with AAMA 2604.

    a. Electrostatic-applied powder coating; single application and cured to a minimum 2.5- to 3.5-mils dry film thickness. Coat interior and exterior of pole for equal corrosion protection.
    b. Color: As indicated in Light Fixture schedule in drawings.

2.3 POLE ACCESSORIES

A. Internal vibration dampeners on poles 25 feet or longer.

B. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

2.4 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi (380,000 kPa).

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.

B. Nuts: ASTM A 563, Grade A, Heavy-Hex

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. Two nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F 436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. One washer provided per anchor bolt.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE FOUNDATION

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match

pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories.

1. Baseplate: Stamped with manufacturer's name, date of production, and cable entry.

C. Anchor Bolts: Install plumb using manufacturer-supplied plywood template, uniformly spaced.

3.3 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.

1. Fire Hydrants and Water Piping: 60 inches (1520 mm).
2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet (3 m).
3. Trees: 15 feet (5 m) from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
2. Install base covers unless otherwise indicated.
3. Use a short piece of 1/2 -inch (13-mm) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch (25 mm) below top of concrete slab.

F. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-(0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.5 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

END OF SECTION 265613

SECTION 265619 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires with LED lamp and drivers.
2. Poles and accessories.

B. Related Sections:

1. Section 265119 "LED Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture, including ballast housing if provided.

E. Pole: Luminaire support structure, including tower used for large area illumination.

F. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed for calculating wind load for poles 50 feet high or less is 115 mph.

    a. Wind Importance Factor: 1.0
    b. Minimum Design Life: 25 years
    c. Velocity Conversion Factors: 1.0

1.5 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated LED lamps, drivers, and accessories.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Drivers, including energy-efficiency data.
7. LED lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
10. Anchor bolts for poles.
11. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.6 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

A. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the Luminaires for a period of 5 years after acceptance of the Luminaires. Warranty shall cover all components comprising the luminaire. All warranty documentation shall be provided to customer prior to the first shipment.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within

specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Base Bid Manufacturers: Are listed on fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected by Architect from manufacturer's full range.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

    a. Color: As selected by Architect from manufacturer's full range.

O. Factory-Applied Labels: Comply with UL 1598. Include recommended LED lamps and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.3 LED LUMINAIRES

A. LED Lamps

1. LED’s shall be manufactured by Nichia, Samsung, Osram or equal.

a. Lumen Output – minimum initial lumen output of each luminaire shall be as specified in light fixture schedule.

2. High-efficacy LEDs mounted to metal-core circuit boards to maximize heat dissipation and promote long life 100,000 hrs. at 40°C, L70.
3. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
4. LED Boards shall be suitable for field maintenance or service with plug-in connectors. LED boards shall be upgradable.
5. Light Color/Quality

   a. Correlated Color temperature (CCT) shall be 4000K, unless otherwise indicated.
   b. The color rendition index (CRI) shall be 67 or greater.

B. Drivers

1. Class 1 electronic driver designed to provide a power factor >90%, THD <20%, with an expected life of 100,000 hours with <1% failure rate.
2. Easily serviceable surge protection device meets a minimum Category C Low operation (per ANSI/IEEE C62.41.2).
3. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
4. Driver shall be UL listed.
5. Maximum stand-by power shall be 1 Watt.
6. Driver disconnect shall be provided where required to comply with codes. The electronics/power supply enclosure shall be internal to the luminaire and be accessible per UL requirements.
7. IP66 rated.

C. Electrical

1. Operation Voltage - The luminaire shall operate from a 50 or 60 HZ ±3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
2. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
3. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent at any standard input voltage.
4. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference.
5. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.
6. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.
7. All electrical components shall be RoHS compliant.

D. Photometric Requirements

1. Luminaire performance shall be tested as described herein.

    a. Luminaire performance shall be judged against the specified minimum illuminance in the specified pattern for a particular application.
    b. Luminaire lighting performance shall be adjusted (depreciated) for the minimum life expectancy.
    c. The performance shall be adjusted (depreciated) by using the LED manufacturer's data or the data from the IESNA Standard TM-21 test report, which ever one results in a higher level of lumen depreciation.

2. The luminaire may be determined to be compliant photometrically if the initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern.
3. The measurements shall be calibrated to standard photopic calibrations.

E. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
2. The LED manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient.
3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient.
4. The luminaire shall have an UL IC rating.
5. The Driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

2.4 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

2.5 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209, 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Cast from A356 aluminum alloy and heat treated to T6 temper. Shaft and tilting section of the hinged base circumferentially welded top and bottom. The tilting and anchored sections of the hinged base shall be joined by a 3/4" diameter solid aluminum pivot rod. The tilting section of the hinged base shall be held in a vertical position by three 1/2"-13 x 2" stainless steel hex head bolts that attach to stainless steel inserts cast into the aluminum base.

C. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Same as pole and luminaire.

E. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

F. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

a. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

F. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices.

END OF SECTION 265600

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. EMT: Electrical metallic tubing.

C. TGB: Telecommunications grounding busbar.

D. TMGB: Telecommunications main grounding busbar.

E. RBC: Rack Bonding Conductor

F. RGB: Rack Grounding Busbar

G. TBB: Telecommunications Bonding Backbone

H. UBC: Unit Bonding Conductor

1.4 REFERENCES

A. The most recent versions of all related documents apply to this project.

B. ANSI/NFPA-70, National Electrical Code (NEC)

C. ANSI/IEEE Std., Recommended Practice for Powering and Grounding Electronic Equipment

D. ANSI/IEEE Std. C2, National Electrical Safety Code (NESC)

E. TIA-607-B Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises

F. ANSI/TIA-606-B Administration Standard for Telecommunications Infrastructure

G. NECA/BICSI 607, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

A. Shop Drawings: Plans showing proposed locations of grounding and bonding infrastructure, including the following:

1. Provide scaled drawings (floor plans not less than 1/16” = 1’-0”) indicating the location and size, dimensions, type of connection (e.g., mechanical, exothermic weld of each bonding busbar (e.g., TMGB, TGB), conductor (e.g., BCT, GE, TBB), connections (e.g., lugs), and splice points.
2. Provide scaled plan and elevation drawings of data room (not less than 1/4” = 1’-0”) indicating locations of busbars (e.g.,TMGB, TGB, UBC, RGB).
3. Bonding and Grounding shall have its own separate drawing(s).

B. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground rings.
3. BCT, TMGB, and routing of their bonding conductors.

C. Qualification Data: For Installer, installation supervisor, and field inspector.

D. Qualification Data: For testing agency and testing agency's field supervisor.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017839 "Project Record Documents," include the following:

a. Result of the ground-resistance test, measured at the point of BCT connection.
b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician, who shall be present at all times when Work of this Section is performed at Project site.

1.9 SYSTEM DESCRIPTION

A. Provide a communications bonding and grounding system as described in this document, documents and drawings specific to that project, and in compliance with the above cited Codes, Standards and Agencies.

B. Comply with the requirement for Section 260526 – Grounding and Bonding for Electrical System.

C. Bond the following items within the telecommunications grounding system.

1. Metallic raceway systems, including metallic cable trays.
2. Communications equipment enclosures (cabinets) or cross-connect frames.
3. Metallic splice cases.
4. All metal cable conduit.
5. Electrical service panels in entrance facilities, telecommunications, and equipment rooms.
6. Wall and rack mounted grounding busbars.
7. Exposed building steel that is within 6 feet of equipment racking systems.
8. All related bonding accessories.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

A. Comply with J-STD-607-A.

2.2 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. General Cable; General Cable Corporation.
2. Southwire Company.

3. Harger Lightning and Grounding
4. Panduit Corp.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding
3. Panduit Corp.
4. Burndy, Hubbell Electrical Systems

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

D. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding
3. Panduit Corp.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 x 4 x 16 inches. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

2.5 GROUND RODS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.

B. Ground Rods: Copper-clad steel, 3/4 inch by 10 feet in diameter.

2.6 RACK BONDING CONDUCTOR KITS (RBC):

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding
3. Panduit Corp.

B. Bonds the rack or cabinet to the telecommunications grounding busbar (TGB or TMGB).

C. Jumper kits with both ends factory terminated to provide a bolt-on solution.

D. Jumper kits with one end factory terminated to attach to the rack or cabinet; free end accommodates unique length requirements.

E. Engineered to comply with US and international grounding requirements.

2.7 EQUIPMENT JUMPER KITS (UNIT BONDING CONDUCTOR OR "UBC")

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding
3. Panduit Corp.

B. Used to ground large, chassis-style rack mounted equipment that have built-in grounding pads or terminals.

C. Bond network equipment to grounding strip or grounding busbar.

D. Jumper kit with both ends factory terminated to provide a bolt-on solution.

E. Jumper kit with one end factory terminated to attach to the grounding strip or grounding busbar; free end accommodates unique equipment terminations.

F. Use jumpers with 90° bent lug, on grounding strip side, for high density grounding requirements up to one ground point per RU.

G. Use jumpers with 45° bent lugs on grounding strip side, for improved cable management.

H. Engineered to comply with US and International grounding requirements.

2.8 MISCELLANEOUS BONDING ACCESSORIES

A. Anti-oxidation Paste (contact aid) for Copper to Copper and Copper to Steel Connections.

B. Green thread-forming bonding screws for bonding smaller equipment on threaded rack rails through the equipment mounting flange.

C. Green bonding cage nuts from bonding smaller equipment on cage nut rails through the equipment mounting flange.

D. Thread forming screws for bonding two-hole lugs to vertical busbars on threaded rack rails.

E. Green paint piercing grounding washers for assuring electrical continuity between painted parts of equipment racks as described in TIA 607-B Standard.

F. Bonding hardware kits (studs) for forming low-resistance bond between the rack or cabinet and painted rack mounted appliances and equipment.

2.9 LABELING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brother International Corporation
2. HellermanTyton
3. Panduit Corp.

B. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with J-STD-607-A.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches

D. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 2/0 AWG.

3.5 GROUNDING BUSBARS

A. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.

B. Locate TMGB so that it is accessible to telecommunications personnel.

C. All metallic raceways for telecommunications cabling located within the same room or space as the TMGB shall be bonded to the TMGB.

D. For outside plant cables entering a building with a cable shield isolation gap, bond the cable shield (on the building side of the gap) to the TMGB. Outside plant protectors shall be bonded to the TMGB with a No. 6 AWG conductor.

E. Connections to busbars shall be made with 2-hole lugs.

F. Connection shall be made by cleaning the area of connection on the busbar and on the two-hole lug and then applying a thin coating of antioxidant compound.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Telecommunications Bonding Backbone (TBB): The telecommunications backbone conductor shall not be smaller than No. 2/0 AWG.

F. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond TMGB to the vertical steel of the building frame.

G. Route BCT in conduit from telecommunications service entrance room to the main electrical service ground connection.

H. Label conduit at telecommunications service entrance with tag or adhesive label that states, “Building Conductor for Telecommunications (BCT) to Main Electrical Service Ground Connection”.

I. Label conduit at main electrical service ground connection with tag or adhesive label that states, “Building Conductor for Telecommunications (BCT) to Telecommunications Main Grounding Busbar (TMGB)”.

J. BCT shall not be run in a metallic conduit and shall not be completely encircled by metallic clamps.

3.7 IDENTIFICATION

A. Installing Contractor shall label all elements of the communications bonding network according to guidelines defined in TIA-607-B and ANSI/TIA 606-B.

B. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.

2. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 270526

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Hooks.
3. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid conduit.

C. IMC: Intermediate metal conduit.

D. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

A. Product data for the following:

1. Boxes, enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel.
b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

D. Galvanized steel.

E. J shape.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-D.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep.
5. Gangable boxes are prohibited.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

G. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

a. Material: Plastic.
b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

I. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: RNC, Type EPC-40-PVC.
2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: IMC. Pathway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: IMC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, communications-cable pathway.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, communications-cable pathway.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: Riser-type, communications-cable pathway.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

E. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

F. Complete pathway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

J. Support conduit within 12 inches of enclosures to which attached.

K. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from nonmetallic conduit and fittings to IMC and fittings before rising above floor.

L. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

P. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

S. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

T. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid, and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull

or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

U. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

V. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

X. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC that is located where environmental temperature change may exceed 100 deg F, and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Y. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.

2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power, and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet o.c.
5. Provide a hook at each change in direction.

Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

BB. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wire-mesh cable tray.
2. Cable tray accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
2. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

a. Vertical and horizontal offsets and transitions.
b. Clearances for access above and to sides of cable trays.
c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cable tray supports.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray layouts on Drawings for specific requirements for sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 WIRE-MESH CABLE TRAY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. B-line, an Eaton business.
2. Chalfant Manufacturing Company.
3. Cooper Industries; Cooper B-Line; GS Metals Corp.
4. Cope Cable Tray; A Part of Atkore International.
5. Enduro Composites Inc.
6. Hubbell Incorporated; Wiring Device-Kellems.
7. Legrand US.
8. MonoSystems, Inc.
9. MP Husky USA Cable Tray & Cable Bus.
10. Niedax Inc.
11. Snaketray.
12. Vutec Corporation.

13. WBT LLC.

B. Description:

1. Configuration: Galvanized- steel wire mesh, complying with NEMA VE 1.
2. Width: 18 inches (600 mm) unless otherwise indicated on Drawings.
3. Minimum Usable Load Depth: 4 inches (150 mm), unless otherwise indicated on the Drawings.
4. Straight Section Lengths: 10 feet (3.0 m) or 12 feet (3.7 m), except where shorter lengths are required to facilitate tray assembly.
5. Structural Performance: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.
6. Class Designation: Comply with NEMA VE 1, Class 8A.
7. Splicing Assemblies: Bolted type using serrated flange locknuts.
8. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

C. Materials and Finishes:

1. Steel:

a. Straight Sections and Fittings: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33, or ASTM A 1008/A 1008M, Grade 33, Type 2 as appropriate.
b. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
d. Finish: Electrogalvanized after fabrication, complying with ASTM B 633.

1) Hardware: Galvanized, ASTM B 633.

2.4 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as for cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA VE 2.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Fasten cable tray supports to building structure.

F. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

G. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

H. Support bus assembly to prevent twisting from eccentric loading.

I. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

J. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

K. Support wire-basket cable trays with center support hangers.

L. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

M. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

N. Make changes in direction and elevation using manufacturer's recommended fittings.

O. Make cable tray connections using manufacturer's recommended fittings.

P. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

Q. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

R. Install cable trays with enough workspace to permit access for installing cables.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."

B. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches (450 mm).

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches (1800 mm).

3.4 CONNECTIONS

A. Connect pathways to cable trays according to requirements in NEMA VE 2.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.

6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.

END OF SECTION 270536

SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. HOLDRITE.
d. Metraflex Company (The).
e. Pipeline Seal and Insulator, Inc.
f. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 270544

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Champion America.
c. emedco.
d. Grafoplast Wire Markers.
e. HellermannTyton.
f. LEM Products Inc.
g. Marking Services, Inc.
h. Panduit Corp.
i. Seton Identification Products.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. HellermannTyton.
c. Marking Services, Inc.
d. Panduit Corp.
e. Seton Identification Products.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester or vinyl flexible labels with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A'n D Cable Products.
    b. Brady Corporation.
    c. Brother International Corporation.
    d. emedco.
    e. Grafoplast Wire Markers.
    f. Ideal Industries, Inc.
    g. LEM Products Inc.
    h. Marking Services, Inc.
    i. Panduit Corp.
    j. Seton Identification Products.

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
4. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester or vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A'n D Cable Products.
    b. Brady Corporation.
    c. Brother International Corporation.
    d. emedco.
    e. Grafoplast Wire Markers.
    f. HellermannTyton.
    g. Ideal Industries, Inc.
    h. LEM Products Inc.
    i. Marking Services, Inc.
    j. Panduit Corp.
    k. Seton Identification Products.

2. Minimum Nominal Size:

    a. 1-1/2 by 6 inches for raceway and conductors.
    b. 3-1/2 by 5 inches for equipment.
    c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. HellermannTyton.
c. Marking Services, Inc.
d. Panduit Corp.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. Ideal Industries, Inc.
3. LEM Products Inc.
4. Marking Services, Inc.
5. Reef Industries, Inc.
6. Seton Identification Products.

B. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

C. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "COMMUNICATIONS CABLE”.

D. Tape:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3 inches.
3. Overall Thickness: 5 mils.
4. Foil Core Thickness: 0.35 mil.

5. Weight: 28 lb./1000 sq. ft.
6. Tensile according to ASTM D 882: 70 lbf and 4600 psi.

2.6 SIGNS

A. Laminated-Acrylic or Melamine-Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Brady Corporation.
   b. Carlton Industries, LP.
   c. emedco.
   d. Marking Services, Inc.

2. Engraved legend.
3. Thickness:

   a. For signs up to 20 sq. in., minimum 1/16 inch thick.
   b. For signs larger than 20 sq. in., 1/8 inch thick.
   c. Engraved legend with black letters on white face.
   d. Punched or drilled for mechanical fasteners with 1/4-inchgrommets in corners for mounting or self-adhesive.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. HellermannTyton.
2. Ideal Industries, Inc.
3. Marking Services, Inc.
4. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws, or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches from cable end.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. Underground-Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:

a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.
3. Faceplate number.

E. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
2. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

a. Room number being served.
b. Colon.
c. Faceplate number.

F. Backbone Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label indicating the following, in the order listed:

1. Room number.
2. Colon.
3. Faceplate number.

H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

I. Instructional Signs: Self-adhesive labels.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.

K. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
3. Equipment to Be Labeled:

a. Communications cabinets.

END OF SECTION 270553

SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications equipment racks and cabinets.
4. Grounding.

B. Related Requirements:

1. Section 260533 “Raceways and Boxes for Electrical Systems” for boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. LAN: Local area network.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.

3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For equipment frames from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of Commercial Installer, Level 2.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as Commercial Installer, Level 2 to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Section 061000 "Rough Carpentry."

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Refer to Specification Section 260533.

2.4 FLOOR-MOUNTED RACKS

A. Manufacturers: Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:

1. Alpha Technologies, Inc.
2. Chatsworth Products, Inc.
3. Hubbell Premise Wiring
4. Middle Atlantic Products, Inc.

B. General Frame Requirements:

1. Distribution Frames: Freestanding, units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
3. Finish: Manufacturer's standard, baked-polyester black powder coat.

C. Floor-Mounted Racks: Modular-type, 84” tall, aluminum construction.

1. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug.
2. Baked-polyester black powder coat finish.

D. Cable Management for Floor-Mounted Racks:

1. Molded black plastic, with integral wire retaining fingers and pass-through holes.
2. Vertical cable management panels shall have front and rear channels, with covers and end panels, and run length of each rack on both sides. Panels shall be Panduit Netrunner Vertical Manager WMPPV45E (45RU) or equal.
3. Horizontal management panels shall have hinged covers and installed below each patch panel on the front and back of the rack. Panels shall be Panduit Patchlink Horizontal Cable Manager WMP1E (2RU) or equal.

E. Power Strips:

1. Comply with UL 1363.
2. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Rack mounting.
4. Eighteen (18) NEMA 5-15R receptacles and NEMA 5-15P power input cord.
5. Provide one (1) power strip per cabinet.

F. Uninterruptible Power Supply:

1. Comply with UL 1778.
2. Rack mounting.

3. 1-hour battery capacity.
4. Transfer time 2-4ms, with less than 5% output voltage distortion.
5. 120V, 19800W/2200VA output.
6. Output connections: Six (6) NEMA 5-15R and two (2) NEMA 5-20R receptacles.
7. Input: NEMA L5-30P power input cord.
8. UPS shall be APC Smart-UPS SMX2200RMLV2U. Provide as shown on Telecommunication Rack Details (Contract Drawings).

G. Floor-mounted racks shall be Chatsworth model 55053-703 or equal.

2.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with J-STD-607-A.

2.6 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Contact AT&T and arrange for installation of demarcation point and protected entrance terminals.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

E. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.3 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

B. Comply with requirements in Section 099000 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.

D. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cabling.
3. Coaxial cable.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Ethernet switches
6. Telecommunications outlet/connectors.
7. Cabling system identification products.

B. Related Sections:

1. Section 270536 "Cable Trays for Communication Systems" for voice and data cabling pathways.
2. Section 260533 "Raceways and Boxes" for voice and data cabling pathways and boxes.
3. Section 271100 "Communications Equipment Room Fittings" for associated telecommunications room equipment.
4. Section 280513 "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

G. UTP: Unshielded twisted pair.

1.4 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal patch panel located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

B. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For all cable types, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.
b. Patch panels.
c. Ethernet switches.
d. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Qualification Data: Submit data of installer’s experience and qualifications.

D. Source quality-control reports.

E. Field quality-control reports.

F. Operation and Maintenance Data: For system components specified herein to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Prior to installation, submit data of installer's experience and qualifications which shall include 3 years on projects of similar complexity. Include names and locations of two projects successfully completed using fiber optic and copper communications cabling systems. Include written certification from users that systems have performed satisfactorily for not less than 18 months. Include specific experience in installing and testing structured telecommunications distribution systems using Category 6A (10 GBPS) unshielded twisted pair. Additionally, experience shall include various interface fabrications for listed cable types.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

E. Grounding: Comply with ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, bridle rings, and D-rings.
3. Straps and other devices.

C. Cable Trays: Comply with requirements in Division 26 Section "Cable Trays for Communications Systems".

D. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems.

2.2 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Systimax Solutions
3. General Cable
4. Siemon Co.

B. Description: 100-ohm, 4-pair Category 6 UTP, with thermoplastic jacket. Jacket color as indicated on drawings for respective system use.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-C.1 for performance specifications.
3. Comply with TIA/EIA-568-C.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panduit Corp.
2. Systimax Solutions
3. Ortronics
4. Siemon Co.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Patch Panel: Modular panels housing multiple-numbered jack units with Category 6A RJ-45 ports on front of panel and 110-style IDC punchdowns on back for permanent termination of pair groups of installed cables.

1. Patch panels shall be 24 or 48-port type for terminating UTP. Provide number of patch panels for each outlet cabled, plus an additional 20% spare.

D. Jacks and Jack Assemblies: Modular, color-coded, Category 6A RJ-45 eight-position modular receptacle units with integral IDC-type terminals.

E. Patch Cords: Factory-made, 4-pair cables in 36-inch, 84-inch, and 144-inch lengths; terminated with 8-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6A performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.
3. Provide one patch cord for every communications port cabled, plus an additional 20% spare. Of the total number of patch cords, 33% shall be provided of each different length specified above.
4. Patch cords shall meet Category 6A UTP cabling specifications.
5. Patch cords shall have jacket colors to match systems cabling as specified herein and on drawings.

2.4 ETHERNET SWITCHES

A. IP Network Switches

1. Network switches shall be Cisco SG500X-52MP or equal 52-port POE managed switches. Provide number of patch panels for each outlet cabled, plus an additional 20% spare.

a. Provide SFP transceiver modules with LC optic fiber connector (singlemode). Quantity as required.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, RJ-45, Category, 6 eight-position modular, color to match respective cabling. Comply with TIA/EIA-568-C.1.

B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate. Provide number of jacks in each workstation outlet to match number shown on contract drawings. Unused ports shall be provided with blank inserts.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
2. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.8 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-C.1.

B. Factory test UTP cables according to TIA/EIA-568-C.2.

C. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways, bridle rings, and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

10. In the communications equipment room and headend locations, install 15-foot-long service loops on each end of cable.
11. At telecommunications and user interface outlets leave 5-foot length of slack cable coiled above ceiling.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
13. Cable shall be installed in 4” conduit sleeves where required to pass through walls.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2. Cabling shall be terminated per T568B pin/pair assignment.
2. Do not untwist UTP cables more than 1/4 inch from the point of termination to maintain cable geometry.
3. Whenever possible, avoid running UTP in locations where temperature will be below 40 degrees Fahrenheit or above 115 degrees Fahrenheit. Humidity should normally be in the range of 8-80%.
4. From each telecommunications outlet, route cabling (number as required per drawings) in 1 inch conduit to above ceiling. Install nylon bushing on end of conduit for cable protection. Provide and install bridle rings for cable routing between end of conduit stub-ups and cable tray in equipment room. Route cabling to equipment room on associated floor and terminate on patch panel. For locations with exposed ceilings or in locations with inaccessible ceilings, route cabling in conduit for entire length to cable tray.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Separation between open communications cables or cables in nonmetallic raceways and EMI Source shall be as follows:

    a. Fluorescent Lighting: A minimum of 12 inches.
    b. Neon Lighting: A minimum of 12 inches.
    c. Unshielded power cable 2KVA or less: A minimum of 5 inches.
    d. Unshielded power cable over 2KVA: A minimum of 39 inches.
    e. Transformer and Motors: A minimum of 39 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify all system components, wiring, and cabling. All labels must be easily viewable. All cables, components and device identities must be unique.

B. Cable and Wire Identification:

1. Label each cable within 6 inches of workstation faceplate and within 12 inches of termination at distribution frame equipment.
2. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 25 feet.
3. UTP cable labels shall indicate workstation faceplate room of termination, connection type, and connection number. See drawings for requirements.

C. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6A marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment, and patch cords, and labeling of all components.
4. UTP Performance Tests:

a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

1) Wire map.
2) Length (physical vs. electrical, and length requirements).
3) Insertion loss.
4) Near-end crosstalk (NEXT) loss.
5) Power sum near-end crosstalk (PSNEXT) loss.
6) Equal-level far-end crosstalk (ELFEXT).
7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

C. Test UTP cable, fiber optic cable, passive network components, and miscellaneous supporting equipment for operational performance. End-to-end continuity, performance, and diagnostic tests should be final tests performed in all cases.

D. Data for each measurement shall be documented and supplied to the Owner and engineer for review. Data for submittals shall be printed in a summary report that is formatted like Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 271500

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. UTP cabling.
2. Single-mode optical-fiber cabling.
3. Coaxial cabling.
4. Control-voltage cabling.
5. Control-circuit conductors.
6. Fire alarm wire and cable.
7. Identification products.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

E. RCDD: Registered Communications Distribution Designer.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of electronic safety and security cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Installation data for UTP and optical-fiber cables as specified in TIA 569-C-1.
2. For coaxial cable, include the following installation data for each type used:

    a. Nominal OD.
    b. Minimum bending radius.
    c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Cross-connects.
    b. Patch panels.
    c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical-fiber cable to determine the continuity of the strand, end to end. Use optical loss test set.
2. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length, and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Systimax Solutions
3. General Cable
4. Siemon Co.

B. Description: 100-ohm, 4-pair Category 6A UTP, with thermoplastic jacket. Jacket color as indicated on drawings for respective system use.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6A.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panduit Corp.
2. Systimax Solutions
3. Ortronics
4. Siemon Co.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Patch Panel: Modular panels housing multiple-numbered jack units with Category 6A RJ-45 ports on front of panel and 110-style IDC punchdowns on back for permanent termination of pair groups of installed cables.

1. Patch panels shall be 24 or 48-port type for terminating UTP. Provide number of patch panels for each outlet cabled, plus an additional 20% spare.

D. Jacks and Jack Assemblies: Modular, color-coded, Category 6A RJ-45 eight-position modular receptacle units with integral IDC-type terminals.

E. Patch Cords: Factory-made, 4-pair cables in 36-inch, 84-inch, and 144-inch lengths; terminated with 8-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6A performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.
3. Provide one patch cord for every communications port cabled, plus an additional 20% spare. Of the total number of patch cords, 33% shall be provided of each different length specified above.
4. Patch cords shall meet Category 6A UTP cabling specifications.
5. Patch cords shall have jacket colors to match systems cabling as specified herein and on drawings.

2.4 OPTICAL-FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ADC.
2. Belden Inc.
3. Berk-Tek; a Nexans company.
4. Corning Cable Systems.
5. Siemon Co.

B. Description: Single-mode enhanced, 4-fiber, tight buffer, optical-fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with TIA-492-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN.

5. Maximum Attenuation: 0.8/0.5 dB/km at 1310/1550 nm.

C. Jacket:

1. Jacket Color: Orange.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.5 CONTROL-VOLTAGE CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.
2. Belden Inc.
3. General Cable Technologies Corporation.
4. Southwire Company.

B. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

2.6 CONTROL-CIRCUIT CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.
2. Belden Inc.
3. General Cable Technologies Corporation.
4. Southwire Company.

B. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in pathway.

C. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in pathway power-limited cable, complying with UL 83, concealed in building finishes.

D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW, or TF in pathway, complying with UL 83.

2.7 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.
2. CommScope, Inc.
3. Genesis Cable Products; Honeywell International, Inc.
4. Superior Essex Inc.
5. West Penn Wire.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.8 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical-fiber cables on reels according to TIA-568-C.1.

C. Factory test UTP cables according to TIA-568-C.2.

D. Factory test multimode optical fiber cables according to TIA-526.14-B and TIA-568-C.3.

E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results. Structural Return Loss shall be less than 20 db.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

A. Install wiring in metal pathways and wireways.

1. Minimum conduit size shall be 3/4 inch. Control and data-transmission wiring shall not share conduits with other building wiring systems.

B. Install cable, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring on Racks and within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM's "Cabling Termination Practices" chapter. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
2. Install lacing bars and distribution spools.
3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
4. Install conductors parallel with or at right angles to sides and back of enclosure.
5. Connect conductors associated with intrusion system that are terminated, spliced, or interrupted in any enclosure onto terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1 and NFPA 70.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

D. Install UTP, optical-fiber, and coaxial cables and connecting materials after spaces are complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

E. General Requirements for Cabling:

1. Comply with TIA-568-C.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels. Leave a minimum of 6 inches of slack at outlet terminations and coil loosely into box after termination on outlet fitting.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Maintain minimum cable bending radius during installation and termination of cables.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions. Do not exceed manufacturer's rated cable-pulling tension.
9. Riser Cable: Riser cable support intervals shall be in accordance with manufacturer's recommendations.
10. Comply with Section 280544 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling."

F. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with Category 6A rating of components and that ensure Category 6A performance of completed and linked signal paths, end to end.

1. Comply with TIA-568-C.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch from point of termination to maintain cable geometry.

G. Optical-Fiber Cable Installation:

1. Comply with TIA-568-C.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

H. Coaxial-Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Install indoor cables in pathway.

I. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart. Cable supports shall be fastened to structural members or floor slabs in accordance with Section 260529 "Hangers and Supports for Electrical Systems."
3. Cable shall not be run in contact with pipes, ducts, or other potentially damaging items. Cables shall not be run through structural members or use structural members, pipes, ducts, or equipment as a support.

J. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communication cables or cables in nonmetallic pathways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communication cables in grounded metallic pathways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between cables in grounded metallic pathways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or hp and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 260533 "Raceways and Boxes for Electrical Systems."

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.

3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or pathway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 CONNECTIONS

A. Comply with requirements in Section 287890 "Integrated Security Management (ISMS)" for connecting, terminating, and identifying wires and cables.

B. Comply with requirements in Section 282300 "Video Surveillance" for connecting, terminating, and identifying wires and cables.

C. Comply with requirements in Section 283100 "Fire-Alarm" for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-C, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

A. For communication wiring, comply with J-STD-607-A and with BICSI TDMM's "Grounding, Bonding, and Electrical Protection" chapter.

3.9 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visually inspect UTP and optical-fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color coding for pin assignments and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment, and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

    a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical-Fiber Cable Tests:

a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
b. Link End-to-End Attenuation Tests:

1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
2) Attenuation test results for links shall be less than 2.0 db. Attenuation test results shall be less than that calculated according to equation in TIA-568-C.1.

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 280526 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.

1.3 DEFINITIONS

A. Signal Ground: The ground reference point designated by manufacturer of the system that is considered to have zero voltage.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Allied Tube & Conduit; a part of Atkore International.
2. Harger Lightning & Grounding.
3. Panduit Corp.
4. Tyco Electronics Corp.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Chatsworth Products, Inc.
3. Harger Lightning & Grounding.
4. Panduit Corp.
5. Tyco Electronics Corp.

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
2. Bond shields and drain conductors to ground at only one point in each circuit.

B. Signal Ground:

1. For each system, establish the signal ground and label that location as such.

2. Bond the signal ground to the alternating-current (ac) power system service by connecting to one of the following listed locations, using insulated No. 6 AWG, stranded, Type THHN wire:

    a. Grounding bar in an electrical power panelboard if located in the same room or space as the signal ground.
    b. Telecommunications grounding busbar.

C. Comply with NECA 1.

3.2 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.

3.3 CONNECTIONS

A. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

B. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

C. Shielded Cable: Bond the shield of shielded cable to the signal ground. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.

D. Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 280526

SECTION 280544 - SLEEVES AND SLEEVE SEALS FOR ELECTRONIC SAFETY AND SECURITY PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Advance Products & Systems, Inc.
    b. CALPICO, Inc.
    c. HOLDRITE.
    d. Metraflex Company (The).
    e. Pipeline Seal and Insulator, Inc.
    f. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 280544

SECTION 282113 - IP CAMERAS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Box-type network cameras for video surveillance.

B. Indoor dome-type network cameras for video surveillance.

C. Indoor in-ceiling mount, dome-type network cameras for video surveillance.

D. Outdoor bullet-type network cameras for video surveillance

E. Outdoor dome-type network cameras for video surveillance.

F. Outdoor pendant mounted, dome-type network cameras for video surveillance.

1.2 RELATED SECTIONS

A. Section 282300 - Video Management System.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with Owner or Owner’s representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner’s representative a schedule and list of participants required to attend coordination and progress update meetings.

1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
2. General Contractor.
3. Project Manager.
4. Manufacturer’s Representative.
5. Project Architect.
6. Project Engineer.
7. Security Consultant.

1.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 013300 “Submittal Procedures”.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:

1. Substrate preparation instructions and recommendations
2. Installation means and methods.
3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:

1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:

1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:

a. Training.
b. Installation.
c. Commissioning.
d. Remote diagnostics and integration with 3rd party software and hardware systems.

1.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

1.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.

1. One spare for each ten (10) devices.
2. Provide spare components as noted in the coordinating schedule for work listed in this section.

1.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:

1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.

2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

1.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.

1. Warranty Period: Parts and labor warranty for 60 months from date of Substantial Completion or date of purchase, whichever comes first.
2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos, and other materials via the internet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.

B. Substitution Limitations:

1. Submit substitution requests in accordance with provisions of Section 012500 "Substitution Procedures".
2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:

a. Video Management System Interfaces.
b. Video Surveillance Positioning Equipment.
c. Video Surveillance Sensors.

2.2 DESIGN CRITERIA

A. System Design:

1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
3. Cameras in this section must be capable of bi-directional communication.
4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:

1. UL and cUL certification marks for Canada/USA.

C. Safety Standards:

1. UL/CSA/IEC/EN 62368-1.
2. With IR: IEC 62471.

D. Electromagnetic Emissions Standards:

1. FCC Part 15 Subpart B Class B.
2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Immunity Standards:

1. EN 55024.
2. EN 61000-6-1.

F. Environmental Standards:

1. Bullet Cameras:

a. UL/CSA/IEC 60950-22.
b. IEC 60529 IP66 and IP67 Weather Rating.
c. IEC 62262 IK10 Impact Rating.

2. Outdoor Dome Cameras:

a. UL/CSA/IEC 60950-22.
b. IEC 60529 IP66 and IP67 Weather Rating.
c. IEC 62262 IK10 Impact Rating.

2.3 PERFORMANCE REQUIREMENTS

A. Standards:

1. Video Standards: H.265 / H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:

a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

4. Interoperability Standards:

a. ONVIF Profile S.
b. ONVIF Profile T.
c. ONVIF Profile G.

B. Video Requirements:

1. Provide cameras capable of simultaneously delivering at least three individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High-Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:

1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.265, H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 30 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 30 frames per second based on resolution configured.
5. Support H.265 encoding in a selectable range from 1 up to 30 frames per second based on resolution configured.
6. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
7. Support Variable Bit Rate (VBR) in H.265 with a configurable maximum bit rate threshold.
8. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
9. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 12 mbps at 30 FPS for 1-3 MP and 20 mbps at 30 FPS for 5-8 MP.
10. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:

1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:

1. User Configurations Supported:

   a. Automatic and manual white balance control.
   b. Automatic and manually defined exposure zones operating in the range 1/7 to 1/8196 sec second.
   c. Flicker control (50 Hz, 60 Hz).
   d. Automatic and manual iris control.
   e. Color saturation and sharpening.
   f. Motion detection sensitivity and threshold.
   g. Digital rotation of the image when used with control center software.

h. Minimum Dynamic Range:

1) 83 dB for 2-5 MP and 85 dB for 6-8 MP. Dynamic Range shall not change based on configured encoding resolution.

F. Adaptive Video Analytics Specifications:

1. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
2. Automatic Analytic set up and tuning of behavior identification:

a. Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
b. The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.

3. Include detection of the following behaviors:

a. Object present in ROI.
b. Object enters ROI.
c. Object leaves ROI.
d. Object appeared.
e. Object disappeared.
f. Object crosses a line of interest or beam.
g. Object Movement Direction.
h. Object loitering.
i. Multiple objects in ROI over specified dwell time.
j. Dwell Time.
k. Number of objects exceeds limit in ROI.
l. Number of objects below limit in ROI.
m. Camera tampering.

G. Network Requirements: Provide video cameras that have the following network capabilities:

1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:

a. Fixed (static) IP address.
b. Subnet mask.
c. Gateway.
d. Control port.

3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

H. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:

1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.

3. Threshold: Percentage of pixels that must detect change.

I. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be triggered by:

1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.

J. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:

1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

K. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:

1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

L. Video Overlay Requirements: Provide video cameras with the following overlay requirements:

1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

M. Security Requirements: Provide video cameras with the following security requirements:

1. Support the use of the following:

a. Password protection.

b. HTTPS Encryption.
c. Digest authentication.
d. WS authentication.
e. User access Log.
f. SSL encryption.

2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

N. Electrical Power: Cameras capable of being powered by the following power sources:

1. PoE: IEEE 802.3af Class 3 PoE Compliant.

O. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:

1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

P. Diagnostics:

1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

Q. Connectivity:

1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

R. Operational Range:

1. Operating Temperature:

a. Box: -10 degrees C to +60 degrees C [14 F to 140 F].
b. Bullet (enclosed space): -40 degrees C to +60 degrees C [-40 F to 140 F].
c. Bullet (ambient convection): -40 degrees C to +65 degrees C [-40 F to 149 F].
d. Dome: -40 degrees C to +65 degrees C [-40 F to 140 F].

2. IR Illumination Operating Temperatures:

a. Bullet: Up to +61 degrees C [141 F], 50% power from +55 degrees C to +61 degrees C [131 F to 141 F].
b. Indoor Dome: Up to +55 degrees C [131 F], 50% power from +44 degrees C to +55 degrees C [111 F to 131 F].
c. Outdoor Dome: Up to +57 degrees C [135 F], 50% power from +49 degrees C to +57 degrees C [120 F to 135 F].

3. IR Illumination Hysteresis:

    a. Bullet: +5 degrees C [9 F].
    b. Indoor Dome: +2 degrees C [3.6 F].
    c. Outdoor Dome: +2 degrees C [3.6 F].

4. Relative Humidity: 0–95 percent (non-condensing).

2.4 2.0 MEGAPIXEL INFRARED IP CAMERAS

A. 2.0 MP Infrared Outdoor Dome-Type Camera with 3.3 - 9 mm lens.

1. Basis of Design Product: 2.0C-H5A-DO1-IR, by Avigilon.
2. Performance:

    a. Image Sensor: 1/2.8-inch progressive scan CMOS.
    b. Maximum Resolution:

        1) Aspect Ratio: 16:9: 1920 x 1080.

    c. Imaging Rate: (50 Hz/60 Hz): 25 fps/30 fps.
    d. Dynamic Range:

        1) WDR Off: 83 dB.
        2) WDR On: 126 dB., dual exposure (30 fps).
        3) WDR On: 132 dB., triple exposure (20 fps or less).

    e. Minimum Illumination:

        1) Color: 0.027 lux.
        2) Monochrome: 0.014 lux.
        3) IR: 0.0 lux.

    f. Field of View:

        1) Horizontal angle: 16:9: 34 degrees to 99 degrees.
        2) Vertical angle: 16:9: 18 degrees to 53 degrees.

B. 2.0 MP Infrared Outdoor Pendant-Mounted Dome-Type Camera with 3.3 - 9 mm lens.

1. Basis of Design Product: 2.0C-H5A-DP1-IR, by Avigilon.
2. Performance:

    a. Image Sensor: 1/2.8-inch progressive scan CMOS.
    b. Maximum Resolution:

        1) Aspect Ratio: 16:9: 1920 x 1080.

    c. Imaging Rate: (50 Hz/60 Hz): 25 fps/30 fps.
    d. Dynamic Range:

        1) WDR Off: 83 dB.
        2) WDR On: 126 dB., dual exposure (30 fps).

3) WDR On: 132 dB., triple exposure (20 fps or less).

e. Minimum Illumination:

1) Color: 0.027 lux.
2) Monochrome: 0.014 lux.
3) IR: 0.0 lux.

f. Field of View:

1) Horizontal angle: 16:9: 34 degrees to 99 degrees.
2) Vertical angle: 16:9: 18 degrees to 53 degrees.

C. 2.0 MP Infrared Indoor Dome-Type Camera with 3.3 - 9 mm lens.

1. Basis of Design Product: 2.0C-H5A-D1-IR, by Avigilon.
2. Performance:

a. Image Sensor: 1/2.8-inch progressive scan CMOS.
b. Maximum Resolution:

1) Aspect Ratio: 16:9: 1920 x 1080.

c. Imaging Rate: (50 Hz/60 Hz): 20 fps/30 fps.
d. Dynamic Range:

1) WDR Off: 83 dB.
2) WDR On: 126 dB., dual exposure (30 fps).
3) WDR On: 132 dB., triple exposure (20 fps or less).

e. Minimum Illumination:

1) Color: 0.027 lux.
2) Monochrome: 0.014 lux.
3) IR: 0.0 lux.

f. Field of View:

1) Horizontal angle: 16:9: 34 degrees to 99 degrees.
2) Vertical angle: 16:9: 18 degrees to 53 degrees.

D. 2.0 MP Infrared Indoor In-Ceiling Mount Camera with 3.3 - 9 mm lens.

1. Basis of Design Product: 2.0C-H5A-DC1-IR, by Avigilon.
2. Performance:

a. Image Sensor: 1/2.8-inch progressive scan CMOS.
b. Maximum Resolution:

1) Aspect Ratio: 16:9: 1920 x 1080.

c. Imaging Rate: (50 Hz/60 Hz): 20 fps/30 fps.
d. Dynamic Range:

1) WDR Off: 83 dB.
2) WDR On: 126 dB., dual exposure (30 fps).
3) WDR On: 132 dB., triple exposure (20 fps or less).

e. Minimum Illumination:

1) Color: 0.027 lux.
2) Monochrome: 0.014 lux.
3) IR: 0.0 lux.

f. Field of View:

1) Horizontal angle: 16:9: 34 degrees to 99 degrees.
2) Vertical angle: 16:9: 18 degrees to 53 degrees.

2.5 5.0 MEGAPIXEL IP CAMERAS

A. 5.0 MP Infrared Outdoor Bullet-Type Camera with 9 - 22 mm lens.

1. Basis of Design Product: 5.0C-H5A-BO2-IR, by Avigilon.
2. Performance:

a. Image Sensor: 1/2.8-inch progressive scan CMOS.
b. Maximum Resolution:

1) Aspect Ratio: 4:3: 2592 x 1944.
2) Aspect Ratio: 16:9: 2560 x 1440.

c. Imaging Rate:

1) WDR Off: (50 Hz/60 Hz): 25 fps/30 fps.
2) WDR On: (50 Hz/60 Hz): 20 fps/20 fps.

d. Dynamic Range:

1) WDR Off: 83 dB.
2) WDR On: 126 dB.

e. Minimum Illumination:

1) Color: 0.058 lux.
2) Monochrome: 0.029 lux.
3) With IR: 0 lux.

f. Field of View:

1) Horizontal angle: 16:9: 14 degrees to 31 degrees.
2) Horizontal angle: 4:3: 14 degrees to 31 degrees.
3) Vertical angle: 16:9: 8.1 degrees to 17.4 degrees.
4) Vertical angle: 4:3: 11 degrees to 23 degrees.

2.6 ACCESSORIES:

A. Brackets and Mounts:

1. H4A-MT-NPTA1: Indoor/outdoor pendant NPT mount.
2. H4A-MT-WALL1: Indoor/outdoor pendant wall arm mount.
3. H4-MT-CRNR1: Aluminum corner mounting bracket for pendant dome cameras.
4. H4-MT-CRNR1: Aluminum corner mounting bracket for bullet cameras.
5. H4-MT-POLE1: Aluminum pole mounting bracket for pendant dome cameras.
6. H4-MT-POLE1: Aluminum pole mounting bracket for bullet cameras.

B. Camera Covers:

1. H4A-DC-CLER1: In-ceiling dome camera cover with clear bubble.
2. H4A-DC-CLER1-BL: Black in-ceiling dome camera cover with clear bubble.
3. H4A-DC-SMOK1: In-ceiling dome camera cover with smoked bubble.
4. H4A-DC-SMOK1-BL: Black in-ceiling dome camera cover with smoked bubble.
5. H4A-DD-CLER1: Indoor dome camera cover with clear bubble.
6. H4A-DD-CLER1-BL: Black indoor dome camera cover with clear bubble.
7. H4A-DO-CLER1: Outdoor dome camera cover with clear bubble.
8. H4A-DO-SMOK1: Outdoor dome camera cover with smoked bubble.
9. H4A-DP-CLER1: Pendant dome camera cover with clear bubble.
10. H4A-DP-SMOK1: Pendant dome camera cover with smoked bubble.
11. H4A-DD-SMOK1: Indoor dome camera cover with smoked bubble.
12. H4A-DD-SMOK1-BL: Black indoor dome camera cover with smoked bubble.

C. Other:

1. CM-AC-GROM1: Pipe grommets.
2. H4A-AC-GROM1: Camera sealing grommets.
3. H4A-DD-SDWL1: Indoor dome camera sidewall knockout plugs.
4. H4A-DD-SDWL1-BL: Black indoor dome camera sidewall knockout plugs.
5. H4-BO-JBOX1: Junction box for bullet cameras.
6. H4-DC-CPNL1: Metal ceiling panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

3.4 System Startup

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).

1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

3.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

3.6 CLOSEOUT

A. Demonstration:

1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:

1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:

1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

END OF SECTION

SECTION 282115 – SPECIALTY IP CAMERAS

PART 1 - GENERAL

1.1 Section Includes

A. Fisheye network cameras for video surveillance.

1.2 RELATED SECTIONS

A. Section 282113 – IP Cameras.

B. Section 282300 - Video Management System.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.

1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
2. General Contractor.
3. Project Manager.
4. Manufacturer's Representative.
5. Project Architect.
6. Project Engineer.
7. Security Consultant.

1.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:

1. Substrate preparation instructions and recommendations
2. Installation means and methods.
3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:

1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:

1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:

a. Training.
b. Installation.
c. Commissioning.
d. Remote diagnostics and integration with 3rd party software and hardware systems.

1.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

1.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.

1. One spare for each 10 devices.
2. Provide spare components as noted in the coordinating schedule for work listed in this section.

1.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:

1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.

1. Do not proceed with remaining Work until workmanship is approved by Architect.
2. Refinish mock-up area as required to produce acceptable work.

1.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.

1. Warranty Period: Parts and labor warranty for 60 months from date of Substantial Completion or date of purchase, whichever comes first.
2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos, and other materials via the internet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.

B. Substitution Limitations:

1. Submit substitution requests in accordance with provisions of Section 012500 "Substitution Procedures".
2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:

a. Video Management System Analytics.
b. Video Management System Interfaces.
c. Video Surveillance Positioning Equipment.
d. Video Surveillance Sensors.

2.2 DESIGN CRITERIA

A. System Design:

1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
3. Cameras in this section must be capable of bi-directional communication.
4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:

1. UL and cUL certification marks for Canada/USA.

C. Safety Standards:

1. UL/CSA/IEC/EN 62368-1.
2. With IR: IEC 62471.

D. Electromagnetic Emissions Standards:

1. FCC Part 15 Subpart B Class B.

E. Environmental Standards:

1. IEC 60529 IP66 and IP67 Weather Rating.
2. IEC 62262 IK10 Impact Rating.

2.3 PERFORMANCE REQUIREMENTS

A. Standards:

1. Video Standards: H.265 / H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:

a. IEEE 802.3at Class 4 (Power over Ethernet) for IR models.
b. IEEE 802.3af Class 3 (Power over Ethernet) for non-IR models.
c. IEEE 802.1X (Authentication).
d. IPv4 (RFC 791).
e. IPv6.

4. Interoperability Standards:

a. ONVIF Profile S.
b. ONVIF Profile T.
c. ONVIF Profile G.

B. Video Requirements:

1. Provide cameras capable of simultaneously delivering at least three individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High-Definition Stream Management and/or Dynamic Bandwidth Management.

A. Encoding Requirements:

4. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
5. Provide independently configured simultaneous H.265, H.264 and Motion JPEG streams (multi-stream).
6. Support Motion JPEG encoding in a selectable range from 1 up to 15 frames per second based on resolution configured.
7. Support H.264 encoding in a selectable range from 1 up to 30 frames per second based on resolution configured.
8. Support H.265 encoding in a selectable range from 1 up to 30 frames per second based on resolution configured.
9. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
10. Support Variable Bit Rate (VBR) in H.265 with a configurable maximum bit rate threshold.
11. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
12. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 12 mbps at 30 FPS for 8 or 12 MP.
13. Support G.711 PCM 8kHz and Opus audio compression.

C. Provide cameras that allow video and audio signals to be transported over:

1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

D. Image Control Requirements:

1. User Configurations Supported:

    a. Automatic and manual white balance control.
    b. Automatic and manually defined exposure zones operating in the range 1/6 to 1/8000 sec second.
    c. Flicker control at 50 Hz and 60 Hz.
    d. Color saturation and sharpening.
    e. Motion detection sensitivity and threshold.
    f. Digital rotation of the image when used with control center software.
    g. Dynamic Range shall not change based on configured encoding resolution.

E. Adaptive Video Analytics Specifications:

1. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
2. Automatic Analytic set up and tuning of behavior identification:

    a. Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.

b. The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.

3. Include detection of the following behaviors:

a. Object present in ROI.
b. Object enters ROI.
c. Object leaves ROI.
d. Object appeared.
e. Object disappeared.
f. Object crosses a line of interest or beam.
g. Object Movement Direction.
h. Object loitering.
i. Multiple objects in ROI over specified dwell time.
j. Dwell Time.
k. Number of objects exceeds limit in ROI.
l. Number of objects below limit in ROI.
m. Camera tampering.

4. Supported Object Types:

a. Person.

F. Network Requirements: Provide video cameras that have the following network capabilities:

1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:

a. Fixed (static) IP address.
b. Subnet mask.
c. Gateway.
d. Control port.

3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:

1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be triggered by:

1. Alarm input terminal.
2. Video motion detection.

3. Camera temperature outside operative range.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:

1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:

1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:

1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:

1. Support the use of the following:

a. Password protection.
b. HTTPS Encryption.
c. Digest authentication.
d. WS authentication.
e. User access Log.
f. SSL encryption.

g. FIPS 140-2 L1 encryption.
h. FIPS 140-2 L3 encryption.

2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
1. 75 W max with 24 VDC aux power, 71W max with 95W PoE, 105 VA with 24 V AC RMS aux power.
2. 95W PoE: POE-INJ2-95W.
3. 60W PoE: POE-INJ2-60W.
4. AC Power: 24 V +/- 10%.
5. DC Power: 24V +/- 10%.
6. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:

1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:

1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:

1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

2.4 SURFACE MOUNTED FISHEYE IP CAMERAS

A. 8.0 MP Fisheye Infrared Camera with 1.4 mm lens.

1. Basis of Design Product: 8.0C-H5A-FE-DO1-IR, by Avigilon.
2. Performance:

a. Image Sensor: 1/1.8-inch progressive scan CMOS.
b. Maximum Resolution; Aspect Ratio: 1:1: 2048 x 2048.
c. Imaging Rate:

1) (50 Hz/60 Hz): 25 fps/30 fps.

d. Dynamic Range:

1) WDR Off: Up to 83 dB.
2) WDR On: Up to 120 dB.

e. Minimum Illumination:

1) Color: 0.20 lux.
2) Monochrome: 0.10 lux.
3) IR: 0.0 lux; maximum distance 17 m (55 ft).

f. Field of View: 360 degrees.
g. Operational Range:

1) Temperature: -40 degrees C to 60 degrees C (-40 F to 140 F).
2) IR Max Temperature: Up to 55 degrees C (131 F).
3) IR at 75 percent power: 27 degrees C to 39 degrees C (80 F to 102 F).
4) IR at 40 percent power: 39 degrees C to 55 degrees C (102 F to 131 F).
5) IR Hysteresis: +2 degrees C (3.6 F).
6) Relative Humidity: 0–95 percent (non-condensing).

2.5 IN-CEILING MOUNTED FISHEYE IP CAMERAS

A. 8.0 MP Fisheye Camera with 1.4 mm lens.

1. Basis of Design Product: 8.0C-H5A-FE-DC1, by Avigilon.
2. Performance:

a. Image Sensor: 1/1.8-inch progressive scan CMOS.
b. Maximum Resolution; Aspect Ratio: 1:1: 2048 x 2048.
c. Imaging Rate:

1) (50 Hz/60 Hz): 25 fps/30 fps.

d. Dynamic Range:

1) WDR Off: Up to 83 dB.
2) WDR On: Up to 120 dB.

e. Minimum Illumination:

1) Color: 0.20 lux.
2) Monochrome: 0.10 lux.

f. Field of View: 360 degrees.
g. Operational Range:

1) Temperature: -10 degrees C to 60 degrees C (14 F to 140 F).
2) Relative Humidity: 0–95 percent (non-condensing).

2.6 PAN-TILT-ZOOM (PTZ) INFRARED NETWORK TYPE CAMERA

A. 2.0 MP 30x IR PTZ Camera with Wiper:

1. Basis of Design Product: 2.0C-H4IRPTZ-DP30-WP, by Avigilon.
2. Performance:

a. Image Sensor: 1/2.8-inch progressive scan CMOS.
b. Active Pixels (H x V): 1920x1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm (0.189 inches x 0.106 inches).
d. Imaging Rate: Up to 60 fps.
e. Dynamic Range: 120 dB.
f. Minimum Illumination:

1) With IR: 0 lux (F1.6).
2) Without IR: Color - 0.1 lux (F1.6), Monochrome - 0.03 lux (F1.6).

g. Resolution Scaling: Down to (16:9) 384x216 or (5:4) 320x256.
h. Angle of View: 2.3 Degrees – 63.7 Degrees.
i. Optical Zoom: 30x.
j. IR Illumination: 250 m (820 ft) maximum distance at 0 lux.

2.7 ACCESSORIES

A. Adapters:

1. H5A-FE-MT-NPTA1: NPT adapter.

B. Mounts:
1. IRPTZ-MNT-WALL1: Mount, Pend wall, IR PTZ.
2. IRPTZ-MNT-NPTA1: Mount, Pend NPT Adapter, IR PTZ.
3. H4-MT-POLE1: Pole Mounting Bracket.
4. H4-MT-CRNR1: Corner Mounting Bracket.

C. Electrical Power:
1. POE-INJ2-95W-NA: Single Port PoE Injector Gigabit, 95W, NA - indoor installation rated.
2. POE-INJ2-60W: Single Port PoE Injector Gigabit, 60W, NA - indoor installation rated.

D. Licenses:

1. CAM-FIPS: License to enable FIPS Level 1 cryptographic mode.
2. CAM-FIPS- CRYPTR-L3: Hardware-based encryption and key management for FIPS Level 3 support and certification.

E. Other:

1. H5A-FE-DD-CLER1: Replacement parts (3) for surface mounted fisheye cameras.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

3.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).

1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

3.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

3.6 CLOSEOUT

A. Demonstration:

1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:

1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:

1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

END OF SECTION

SECTION 283100 - FIRE ALARM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. General: Noncoded, addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control of smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

B. System shall be capable of interfacing with Campus-Wide Fire & Security systems via dedicated fiber network communications. Contractor shall furnish and install Edwards (UTC) brand equipment in order to interface with other life safety systems.

1.5 SUBMITTALS

A. Product Data: Submit factory prepared literature for each type of product indicated.

B. Product Testing Requirements: Submit written documentation from Underwriter's Laboratory stating submitted brand of smoke detectors do not require scheduled, smoke chamber sensitivity testing. Detectors brand and model that do not have written documentation from U.L. specifically indicating that states periodic smoke chamber, sensitivity tests are not required will be deemed nonresponsive to these specifications and will be not be reviewed.

C. Shop Drawings:

1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
2. Contractor shall provide the following information in the installation diagrams as a minimum. Failure to provide this information shall cause the submittal to be rejected as non-responsive. Fire Alarm drawings shall include:

    a. Example of web based reporting system and bar coding that will be used to certify fire alarm mass notification emergency communication system that allows time stamped reporting of test results for each device of the system as required herein.
    b. Letter signed by Contractor stating that each fire alarm device shall include a custom bar-code label as required to support web based testing and documentation installed prior to system acceptance.
    c. Battery Calculations for each Aux Power supply
    d. Provide calculations on the installation drawings that display Notification Appliance Circuit calculations for each device on each notification circuit that include the following as a minimum;

        1) Current draw
        2) Voltage drop
        3) Maximum distance allowed

    e. This information shall be displayed starting with NAC circuit #1, device #1, then device #2 and so on to the last device on the circuit. Next line of information shall display NAC circuit #2 in the same format and Contractor shall continue with information from first device of the first NAC through the last device of the last NAC.
    f. All NAC calculations shall; be based on the following minimum criteria:

        1) Each NAC circuit shall not exceed 3 Amp maximum
        2) Each NAC circuit shall include a minimum of 20% spare capacity.
        3) Each Aux Power Supply shall have a 20% spare capacity overall
        4) Each NAC circuit shall calculation shall be based on worst case scenario of each device having 16VDC available from circuit. This calculation is required in order for Engineer to determine that power supply batteries have been sized to meet minimum time requirements of 24 hours of supervision followed by 5 minutes of alarm for battery back up. Failure to use 16VDC as standard operating voltage for each device's calculations shall cause the submittal to be rejected as non-responsive.

3. Floor Plans: Indicate final outlet locations and routings of raceway.
4. Device Address List: Coordinate with final system programming.
5. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

D. Operating Instructions: For mounting at the FACP.

E. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.

F. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

H. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.

I. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

J. Certificate of Completion: Comply with NFPA 72.

K. Contractor shall include all costs associated with having fire alarm system programmer provide CD of site specific data files following acceptance by the Authority Having Jurisdiction. Contractor shall be held responsible for delivery of current fire alarm data files on CD to Owner's representative. Any subsequent changes to the data files within the warranty period shall be copied to a CD and delivered to the Owner's representative. Failure to provide this required information shall prevent Contractor from receiving final payments.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Contractor shall include all costs associated with providing factory certified technician(s) for this model fire alarm equipment from a local factory authorized service organization to provide installation supervision of this fire alarm equipment for this project location.

B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance and authorized local service organization with factory certified technician for specified equipment model numbers.

C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

E. Comply with NFPA 72.

1.7 BUILDING CODES and STANDARDS

A. Apply latest adopted versions of all codes and standards unless these specifications stipulate a specific version

B. National Fire Protection Association (NFPA):

1. NFPA-70 National Electrical Code (NEC)
2. NFPA-72 National Fire Alarm Code

    a. Chapter 12 - Emergency Communications ROP-568 shall be applied to this project as if it were part of the approved NFPA-72.

3. NFPA 101 Life Safety Code
4. IBC International Building Code
5. IFC International Fire Code
6. IMC International Mechanical Code

C. National Electrical Manufacture's Association (NEMA)

D. Underwriters Laboratories, Inc. (UL)

1. UL-864 Control Units for Fire Protective Signaling Systems (9th Edition)
2. UL-268 Smoke Detector for Fire Protective Signaling Systems
3. UL-268A Smoke Detectors for Duct Applications
4. UL-521 Heat Detectors for Fire Protective Signaling Systems
5. UL-464 Audible Signaling Appliances
6. UL-1971 Signaling Devices for the Hearing Impaired
7. UL-38 Manually Actuated Signaling Boxes
8. UL-1480 Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
9. UL-1481 Power Supplies for Fire Protective Signaling Systems
10. UL-1638 Signaling Appliances – Private Mode Emergency and General Utility Signaling
11. UL 2572 Control and Communication Units for Mass Notification Systems
12. Note control equipment that is not dually UL 864 and 2572 listed are not acceptable.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Smoke Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than one unit of each type.
2. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than one unit of each type.
3. Keys and Tools: One extra set for access to locked and tamperproofed components.

1.9 WARRANTY and SOFTWARE AGREEMENT

A. Contractor shall warranty all materials, installation and workmanship for one (1) year from date of acceptance, unless otherwise specified. Contractor shall include statement in submittal that factory sponsored equipment warranty can be extended to five(5) years from date of shipment with a service agreement with Edwards Strategic Partner, Authorized Systems service organization for this project location.

B. Contractor shall direct the authorized service provider supply to provide proposal to End User to provide 12 month of UL Listed Central Station Monitoring 20 days prior to system acceptance, 12 month of inspection services using web based "Building Reports" inspection and reporting services and 12 month factory sponsored equipment warranty extension within 20 days following system acceptance. System shall be capable of utilizing cellular and/or IP based wireless communications for monitoring.

C. A copy of system warranty shall be provided with closeout documentation and included with the operation and installation manuals.

D. Detector Sensitivity Testing: Contractor shall include all costs associated with providing smoke detector sensitivity testing performed by factory certified service organization and provide reports to the Owner if letter from UL is not available stating system is UL listed to perform automatic sensitivity testing without any manual intervention. A copy of UL letter shall be provided as proof of system operation.

E. Upgrade Service: Contractor shall include all costs associated with utilizing factory authorized service organization to provide latest version of system firmware/software at project completion and as available from Factory during the one (1) year period following system acceptance.

F. Contractor shall provide a minimum of 30 days' notice to owner to allow scheduling and access to system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Edwards Systems Technology; a part of UTC Fire & Security.

B. Model numbers shown represent the minimum required features and characteristics for the functions and operation of the fire alarm system. Any and all deviations from equipment characteristics and/or functions for from the minimum requirements shall be identified with specification section references and shall be included with submittal. Failure to include this information shall cause the submittal to be deemed non-responsive and returned without engineering review

C. This fire alarm control panel shall be capable and U.L. Listed for attaching to Edwards FireWorks graphical workstation.

D. Substitutions: Prime Bidding Contractors may submit substitute brand of fire alarm system equipment at least 14 days prior to bid date for review. Requests for substitutions by firms other than prime bidders will not be honored. Prime Bidding Contractors request for substitutions shall include equipment submittal. Equipment substitution request submittal shall include the following as a minimum;

1. Line-by-line listing of each deviation from specified brand.
2. All information required by Submittals section of this specification section 1.5 A., 1.5 B., 1.5 C., 1.5 D. 2.A.,1.5 D. 2B. and 1.5 D5.

3. Prime contractor signed letter agreeing to provide warranty and software per section 1.9.

E. Approved substitutions shall have minimum system capacities, minimum system features and require the same type/style cables and power requirements as the specified brand. Final review of brand substitution shall take place prior to project acceptance and Prime Contractor shall be responsible to make any required changes to meet specification prior to system acceptance,

2.2 CIRCUITING GUIDELINES

A. Each addressable analog loop shall be circuited so device loading is not to exceed 80% of loop capacity in order to leave for space for future devices.

B. System circuits shall be configured as follows:

1. Addressable analog SLC loops Class B (Style 4)
2. Initiating Device Circuits Class B (Style B)
3. Notification Appliance Circuits Class B (Style Y)
4. Network Communications Class A (Style 7)
5. Annunciator Communications Class B.

C. Where it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class B zone wiring.

D. Each of the following types of devices or equipment shall be provided with supervised circuits as shown on the drawings but shall be typically as follows:

1. Sprinkler Valve Supervisory Switches: Provide one (1) supervisory module circuit for each sprinkler valve supervisory switch.
2. When waterflow and tamper switches exist at the same location, provide one (1) dual input addressable module. When odd numbers of devices exist at a single location, provide additional single input addressable modules.

E. Each of the following types of alarm notification appliances shall be circuited as shown on the drawings but shall be typically as follows:

1. Audible Signals: Provide sufficient spare capacity to assure that the addition of five (5) audible devices can be supported without the need for addition control components (power supplies, signal circuit modules, batteries, etc.)
2. Visual Signals Provide sufficient spare capacity to assure that the addition of three (3) audible devices can be supported without the need for addition control components (power supplies, signal circuit modules, batteries, etc.)

F. Remote equipment associated with the fire alarm system shall be provided with a form 'C' control relay contact as shown on the drawings.

G. Provide a dedicated 24VDC circuit to feed all auxiliary relays required for inductive loads. Circuits shall be supervised via an end-of-line relay and addressable input module. Auxiliary relays shall not derive their power from the starter or load being controlled.

H. Each control panel, power supply panel or data gathering panel shall have a dedicated 20Amp-120VAC feed. This feed shall come from an emergency or lighting circuit breaker panel, and shall have a locked circuit breaker. Earth grounds shall also terminate to the same circuit breaker panel from each respective control panel.

2.3 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

B. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

C. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.

D. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.

E. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines. Owner is responsible to furnish a Central Station monitoring service UL Listed for commercial fire alarm applications to monitor the fire alarm system. Contractor shall furnish and install a quantity of two (2) pair CAT5, plenum rated cable from the Fire Alarm Control panel to the main incoming telephone service “point of demarcation” punch down equipment. This system shall share two (2) of the Owner’s telephone lines and utilize “line seizure” as needed as defined by USOC standard RJ31X style telephone receptacles.

F. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when a single ground or open circuit occurs in an initiating device circuit, signal line circuit, or notification-appliance circuit.

G. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

H. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a smoke or flame or heat detector, or operation of a sprinkler flow device initiates the following:

1. Notification-appliance operation.
2. Identification at the FACP and the remote annunciator(s) of the device originating the alarm.
3. Transmission of an alarm signal to the remote alarm receiving station Central Station Service monitoring service provided by Owner.

4. Release of fire and smoke doors held open by magnetic door holders.
5. Shutdown of fans and other air-handling equipment serving zone when alarm was initiated.
6. Recording of the event in the system memory.

I. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP and the remote annunciator.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

J. Water-flow alarm switch operation initiates the following:

1. Flashing of the device location-indicating light for the device that has operated.
2. Transmission of an alarm signal to the FACP, remote alarm receiving station and recording of the event in the system memory.

K. Sprinkler valve-tamper switch operation initiates the following:

1. A “trouble” signal indication at the FACP and the annunciator.
2. Transmission of supervisory signal to remote alarm receiving station.
3. Recording of the event in the system memory.

L. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. Same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity-adjustment schedule changes are recorded in system memory and are printed out by the system printer.

M. Removal of an alarm-initiating device or a notification appliance initiates the following:

1. A "trouble" signal indication at the FACP and the annunciator for the device or zone involved.
2. Recording of the event in the system memory.
3. Transmission of trouble signal to remote alarm receiving station.

N. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.4 SUPPORT FOR INSTALLER AND OWNER MAINTENANCE

A. Provide a coded one-man walk test feature. Allow audible or silent testing. Signal alarms and troubles during test. Allow receipt of alarms and programmed operations for alarms from areas not under test.

B. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.

C. Provide loop controller diagnostics to identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the circuit wiring of remote module shall be identified by device address.

D. Allow the user to display/report the condition of addressable analog detectors. Include device address, device type, percent obscuration, and maintenance indicator. The maintenance indicator shall provide the user with a measure of contamination of a device upon which cleaning decisions can confidently be made.

E. Allow the user to report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity. Include Facility Name, Licensee, Project Program Compilation date, Compiler Version, Project Revision Number, and the time and date of the History Report.

F. Allow the user to disable/enable devices, zones, actions, timers and sequences. Protect the disable function with a password.

G. Allow the user to activate/restore outputs, actions, sequences, and simulate detector smoke levels.

H. Allow the service user to enter time and date, reconfigure an external port for download programming, initiate auto programming and change passwords. Protect these functions with a password.

I. THE END-USER SHALL RETAIN COMPLETE RIGHTS AND OWNERSHIP TO ALL SOFTWARE RUNNING IN THE SYSTEM. The fire alarm equipment vendor shall provide useable hard and soft copies of the software database to the End-User at project completion and at the end of the warranty period. The database provided shall be useable by any authorized and certified distributor of the product line, and shall include all applicable passwords necessary for total and unrestricted use and modification of the database. The Consulting Engineer shall define the extent of hardcopy database documentation to be provided.

2.5 EST3 FIRE ALARM PANEL

A. The main control panel or remote control panel(s) shall be a multi-processor based networked system designed specifically for detection, and one-way emergency audio communications applications. The control panel(s) shall be listed and approved for the application under the standard(s) as listed. The control panel shall be model EST3 (or approved equivalent system capable of communicating with the Owner’s existing

Edwards EST3 network) and shall be listed and approved for the application standard(s) as listed under the General section.

B. The control panel(s) shall include all required hardware, software and site-specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified using software provided by a single supplier. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

C. The network of control panels shall include the following features.

1. Ability to download all network applications and firmware from the configuration computer on the network or at any control panel (network node) location.
2. Each control panel (network node) shall have an LCD display with common controls. The display shall be configurable to display the status of any and all combinations of alarm, supervisory, trouble, monitor, or group event messages.
3. Each LCD display on the system shall be capable of being programmed for control functions of any node or the entire network. The LCD display shall reside on the network as a node and continue to operate with or without multiple faults fault on the network. An LCD can be programmed to be only operational when a node is operational in stand-alone mode, with a network fault.
4. The system program shall have a minimum of 100 system definable Service Groups to facilitate the testing of installed system based on the physical layout of the system. Service groups that disable entire circuits serving multiple floors or fire zones shall not be considered as equal.
5. Advanced Windows based programming with Program Version Reporting to document any and all changes made during system start-up or system commissioning. Time and date stamps of all modifications made to the program must be included to allow full retention of all previous program version data. The operator display shall clearly identify unacknowledged and acknowledged alarm, supervisory, trouble, and monitor status messages. The system shall provide the ability to download data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The downloaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.
6. Provide system reports that list a detailed description of the status of system parameters for corrective action or for preventive maintenance. Reports shall be displayed on the operator interface or be capable of being sent to a printer.
7. Provide an authorized operator with the ability to operate or modify system functions such as system time, date, passwords, holiday dates, restart the system and clear the control panel event history file.
8. Provide an authorized operator the ability to perform test functions within the installed system.
9. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure. The system shall provide fail-safe operation, with multiple-levels of system operation

D. Each network control panel shall be capable of:

1. Supporting up to 2500 intelligent analog/addressable points.
2. Supporting up to ten (10) intelligent addressable loops, each loop supporting 125 detectors and 125 modules, total of 250 points per loop.

3. Supporting network connections up to 63 other control panels and annunciators.
4. Supporting up to 124 (security/access control) Keypad/Displays.
5. Support up ten network digital dialers with Contact ID or SIA format and TAP Pager protocol.
6. Supporting multiple RS-232 communication ports and protocol.
7. Supporting up to 1000 chronological history events.
8. Total network response shall not exceed 3 seconds
9. Networking with EST3 and/or EST-3X control panels located in remote buildings utilizing dedicated single mode fiber cable network.

E. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, monitor, trouble and component status messages and control menu.

1. The common control switches and with corresponding LEDs provided as minimum will be; Reset, Alarm Silence, Panel Silence, and Drill. It shall be able possible to add additional switches/LEDs as required.
2. The main control panel shall have a display that is a 24 lines by 40 character graphic LCD and backlit when active.
3. Each point shall have a custom event message of up to 40 charters, for a total of 80 characters. In addition instructional text messages shall be supported with a maximum of 2,000 characters each.
4. Provide 8 simultaneous events to be displayed. The first seven (7) highest priority events in addition to the most recent event. The events shall be automatically placed in event types (Alarm, Supervisory, Monitor & Trouble) for easy access and it shall be possible to view the specific event type separately. Having to scroll through a mixed list of event types is not acceptable.
5. Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.
6. This display shall be an EST 3-LCDXL1.
7. Systems not capable of such a display on the main panel faceplate shall include a CRT/Monitor display meeting the above requirements and battery stand-by.

F. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions

G. Circuits Requirements:

1. Signaling Line Circuits for Network Communications:

   a. Class A, Style 7.

2. Signaling Line Circuits for Intelligent Analog Addressable Loop:

   a. Class B, Style 4.
   b. No more than 100 detectors or 100 modules installed on a loop.

3. Initiating Device Circuit:

   a. Class B, Style B

4. Notification Appliance Circuits:

    a. Class B, Style Y.
    b. Maximum circuit loading to 2 amps for visuals.

5. Activation of alarm notification appliances, smoke control, elevator recall and other functions shall occur within 3 seconds after the activation of an initiating device.

H. FACP Power Supply Requirements:

1. Each control system power supply shall be a minimum of 6 amps @ 24 vdc.
2. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any alarm, trouble or operator acknowledgment signals.
3. Each system power supply shall be annunicated individually and shall annunciate as a trouble signal, identifying the inoperable power supply.
4. All standby batteries shall be continuously monitored by the system. Low battery and disconnection of battery power supply conditions shall immediately annunciate as a trouble signal, identifying the deficient batteries.
5. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.
6. All AC power connections shall comply with section 4.4.1 Power Supplies of the 2007 edition of NFPA 72 National Fire Alarm Code.
7. Smoke-Alarm Verification:
8. Initiate an audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
9. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
10. Record events by the system printer.
11. Sound general alarm if the alarm is verified.
12. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

I. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm-initiating devices, except those listed, shall not start elevator recall.
2. Elevator lobby detectors except the lobby detector on the designated floor.

    a. Smoke detector in elevator machine room.
    b. Smoke detectors in elevator hoistway.

3. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
4. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

    a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

J. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

K. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change to alternate settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

L. EST3 Digital Alarm Communicator Transmitter: The system shall have an integrated off premise communications capability using a digital alarm communications transmitter (DACT) for sending system events to multiple central monitoring station (CMS) receivers. The system shall provide the CMS(s) with point identification of system events using 4/2, 3/1, Contact ID or SIA DCS protocols. The dialer shall have the capability to support up to 255 individual accounts and to send account information to eight (8) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being directed to one or more receivers depending on event type or location as specified by the system designed. In the event of a panel CPU failure during a fire alarm condition, the DACT degraded mode shall transmit a general fire alarm signal to the CMS.

1. Digital data transmission shall include the following (Contact ID)

    a. Address of the alarm-initiating device.
    b. Loss of ac supply or loss of power.
    c. Low battery.
    d. Abnormal test signal.
    e. Communication bus failure

2. Alpha-Numerical Pager Interface: The system shall transmit an alphanumeric system activity message, by event, by point descriptor to a commercial paging system of the owner's choice, using TAP Pager protocol.
3. Shall be GE-EST, model 3-MODCOM/P

M. Contractor shall furnish and install one (1) EST Model # EST3 control panel (or approved equivalent system capable of communicating with the Owner's existing Edwards EST3 network) complete with chassis space and surface mounted enclosure as needed to support active components and 20% spare capacity. Mount with top of box at 72" above finished floor. Contractor shall install fiber termination panel adjacent to fire alarm control panel. Contractor shall install dedicated 20Amp circuit with proper grounding for the control panel.

2.6 EST3 FACP Remote Annunciation;

A. Annunciator shall match those of fire-alarm control unit LCD display functions for alarm, supervisory, monitor and trouble indications and common system controls including; acknowledging, silencing, resetting and testing. Annunciator shall include features indicated in section 2.3 E and 2.3 G.

1. This display shall be GE-EST, model 3-LCD with accessories as needed.

B. Mount with top of box at 60" above finished floor.

2.7 MANUAL PULL STATIONS

A. Description for new addressable pull station locations: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.

1. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm.
2. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
3. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
4. Break-Glass Features: Stations requiring the breaking of a glass panel or rod are not acceptable.
5. Contractor shall furnish and install EST Model # SIGA-278 or approved equal complete with surface or recess mount enclosure as needed. Mount all pull stations with top of box at 48” above finished floor.
6. Contractor shall furnish and install clear covers modules with audio signal upon opening the cover. Quantity one(1) shall be installed at each pull station location and shall be SSI model #13020FR or approved equal.

2.8 INTELLIGENT DETECTORS

A. General: Intelligent Detectors shall include the following features:

1. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.
2. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device’s address by physical means shall not be necessary.
3. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol.
4. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable.
5. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.5 seconds.
6. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog

loop controller. A red LED shall flash to display alarm status. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.

7. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level.
8. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient "Environmental Thresholds" approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24-hour long term and 4-hour short-term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.
9. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.
10. Operating Voltage: 24-V dc, nominal.
11. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
12. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
13. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
14. Sensitivity: Can be tested and adjusted in-place after installation.
15. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
16. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
17. Optical smoke sensing technology with optional carbon monoxide sensor
18. Field replaceable smoke chamber
19. Field replaceable carbon monoxide sensor/daughterboard module.

B. Photoelectric Smoke Detectors: Include the following features:

1. Provide intelligent photoelectric smoke detectors. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data.
2. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or the SIGA-PRO Signature Program/Service Tool.

3. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications.
4. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.
5. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%.
6. The photo detector shall be suitable for operation in the following environment:

    a. Temperature: 32oF to 120oF (0oC to 49oC)
    b. Humidity: 0-93% RH, non-condensing
    c. Elevation: no limit.

7. Smoke Detectors shall have U.L. approval for automatic "smoke sensitivity" testing. Submittal and shall include a copy of a letter from U.L verifying that manual "smoke sensitivity" testing is not required for this type of detector. Smoke detectors that are required by code for the Owner to manually test the sensitivity and maintain proper records of these tests shall not be accepted. Failure to include this U.L. letter with the submittal shall cause submittal to be rejected as non-responsive.
8. Furnish and install EST Model # SIGA2-PS or approved equal complete with #SIGA-SB4 detector base with extended “trim skirt” to hide ceiling tile penetrations.

C. Duct Smoke Detector: Photoelectric type.

1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied.
2. Relay Fan Shutdown: Each duct smoke detector shall be furnished with an addressable, programmable relay. This relay shall be used for local HVAC shutdown as programmed to operate from the main FACP. This relay shall be rated for 2 amps. Contractor shall furnish and install “step-up” relay if required to interface with fan motor-control circuit current in excess of 2 amps.
3. Damper Control Relay: Each duct smoke detector located for use with a damper location, shall be furnished with an addressable, programmable relay. This relay shall be used for damper control as programmed to operate from the main FACP. This relay shall be rated for 2 amps. Contractor shall furnish and install “step-up” relay if required to interface with damper control circuit current in excess of 2 amps.
4. At no time shall 120VAC be allowed to share the same EMT raceway as the fire alarm cable/circuits.
5. Provide quantities of duct smoke detectors to suite installed duct and equipment configurations as required by code. As a minimum, furnish and install one duct detector for each air handling unit in excess of 2,000 cfm air movement located in the return duct work. For each air handling unit 15,000 cfm or above, furnish and install duct detector in both return and supply ducts (unless 100% outside air is used for supply).
6. Each duct detector shall include a remote indication LED to allow Owner to see the alarm status. This shall be situated on a single gang faceplate. The faceplate shall be installed below the finished ceiling in a recess mounted single gang enclosure and clearly labeled with AHU # and the addressable number of the duct detector. Contractor shall furnish and install these devices for each duct detector whether shown on the project plans or not.

7. Smoke Detectors shall have U.L. approval for automatic "smoke sensitivity" testing. Submittal shall include a copy of a letter from U.L verifying that manual "smoke sensitivity" testing is not required for this type of detector. Smoke detectors that are required by code for the Owner to manually test the sensitivity and maintain proper records of these tests shall not be accepted. Failure to include this U.L. letter with the submittal shall cause submittal to be rejected as non-responsive.
8. Contractor shall furnish and install complete duct detector assemblies as indicated on the project drawings and required herein, each duct unit shall consist of the following minimum equipment components; EST Model # SIGA-SD or approved equal complete with one(1)SIGA-CR programmable relay, one(1)PAM-1 isolation relay for AHU control, one(1) SIGA-LED remote indicating LED station, one(1)SD-TRK remote test station with key control, and one(1)SDT-XX air inlet tube sized to fit duct work.

D. Addressable Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate of rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.

1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
2. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data.
3. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135oF (57oC) and a rate-of-rise alarm point of 15oF (9oC) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.
4. Mounting: Plug-in base, interchangeable with smoke detector bases.
5. Integral Addressable Module: Arranged to communicate detector status to the FACP.
6. Electrical Contractor shall furnish and install EST Model # SIGA2-HRS addressable heat detector or approved equal as shown on project drawings complete with #SIGA-SB4 detector base with extended “trim skirt” to hide ceiling tile penetrations.

E. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Provide intelligent fixed temperature heat detectors. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
2. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data.
3. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135oF (57oC).
4. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.
5. Mounting: Plug-in base, interchangeable with smoke detector bases.

6. Integral Addressable Module: Arranged to communicate detector status to the FACP.
7. For each location shown on project drawings Electrical Contractor shall furnish and install EST Model # SIGA2-HRS addressable heat detector or approved equal complete with #SIGA-SB4 detector base with extended “trim skirt” to hide ceiling tile penetrations.

F. Addressable Carbon Monoxide (CO) Detector Type: Actuated by either a fixed temperature of 135 deg F or rate of rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.

1. Provide intelligent addressable Carbon Monoxide Detector with Temporal 4 Audible Base. The CO detection element shall indicate a trouble condition at the FACP signaling end of life and the CO element of the detector shall be field replaceable.
2. It shall be programmed at the main control panel as a supervisory indication and transmit a separate supervisory signal to the central station.
3. The CO detector shall be UL 2075 listed.
4. Mounting: Plug-in base, interchangeable with smoke detector bases.
5. Integral Addressable Module: Arranged to communicate detector status to the FACP.
6. For each location shown on project drawings Electrical Contractor shall furnish and install EST Model # SIGA2-COS addressable heat detector or approved equal complete with audible sounder detector base with extended “trim skirt” to hide ceiling tile penetrations.

2.9 OTHER ADDRESSABLE DEVICES

A. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.

B. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device’s address by physical means shall not be necessary.

C. Programmable Relay for Access Control Door Unlocking: Furnish and install programmable relay(s) as needed to control door lock circuit(s) for this project. Relay(s) shall be mounted adjacent to the access control panel and be clearly labeled. Relays shall connect to the addressable loop and shall be programmed to operate as approved by the Local Authority with Jurisdiction. Unless otherwise instructed, Contractor shall program the relay to operate on general alarm conditions. Contractor shall furnish and install any “step –up” relays as needed to isolate from access control system. The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted.

1. Mounting: Install in an industry standard recess mounted enclosure mounted adjacent to the door access control panel.

2. Furnish and install EST Model # SIGA-CR addressable relays or approved equal.

D. Programmable Relay for Door Holder Circuit: Furnish and install programmable relay(s) as needed to control door holder circuit(s) for this project. Relays shall be mounted adjacent to the fire alarm control panel and be clearly labeled. Relays shall connect to the addressable loop and shall be programmed to operate as approved by the Local Authority with Jurisdiction. Unless otherwise instructed, Contractor shall program the relay to operate on general alarm conditions. Contractor shall furnish and install any "step –up" relays as needed to support the door holder circuit load. Contractor shall furnish 24V DC circuit from the control panel or auxiliary power supply as needed to support the door holder circuit(s). The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted.

1. Mounting: Install in an industry standard recess mounted enclosure mounted adjacent to the fire alarm control panel.
2. Furnish and install EST Model # SIGA-CR addressable relays or approved equal.

E. Programmable Relay for Roll Down Doors: Furnish and install programmable relay(s) as needed to control roll down doors for this project. Relays shall be mounted adjacent to the roll down door and be clearly labeled. Relays shall connect to the addressable loop and shall be programmed to operate as approved by the Local Authority with Jurisdiction. Unless otherwise instructed, Contractor shall program the relay to operate on general alarm conditions. Contractor shall furnish and install any "step –up" relays as needed to support the door holder circuit load. Contractor shall furnish power as needed to support the operation of the roll down doors. The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted.

1. Mounting: Install in an industry standard recess mounted enclosure mounted adjacent to the roll down door control.
2. Furnish and install EST Model # SIGA-CR addressable relay or approved equal

F. Programmable Relay for Elevator Recall: Furnish and install programmable two (2) relays as needed to control each Elevator during a fire alarm per code requirements. Relays shall be mounted adjacent to the elevator control equipment and shall be clearly labeled. Relays shall connect to the addressable loop and shall be programmed to operate as approved by the Local Authority with Jurisdiction. Unless otherwise instructed, Contractor shall program the primary relay to operate on general alarm conditions. The primary relay shall be interconnected with the Elevator controls to cause the elevator cab to go to the ground floor, open the doors, and remain. The secondary relay shall be interconnected with the Elevator controls to cause the elevator cab to go to the "alternate" floor location as approved by local authority with jurisdiction. When sent to the alternate floor, the elevator cab shall open the doors, and remain. Contractor shall furnish and install any "step –up" relays as needed to support the interface with the elevator controls. The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted. The elevator lobby smoke detectors shall be programmed to initiate the primary and alternate relays. Relays shall be located within three (3) feet of equipment being controlled.

1. The primary relay shall be interconnected with the Elevator controls to cause the elevator cab to go to the ground floor, open the doors, and remain.
2. The secondary relay shall be interconnected with the Elevator controls to cause the elevator cab to go to the "alternate" floor location as approved by local

authority with jurisdiction. When sent to the alternate floor, the elevator cab shall open the doors, and remain.

3. Contractor shall furnish and install any "step-up" relays as needed to support the interface with the elevator controls. The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted. The elevator lobby smoke detectors shall be programmed to initiate the primary and alternate relays

    a. Mounting: Install in custom manufactured enclosure one (1) model # SIGA-UIO6 identified herein.
    b. Furnish and install quantity two (2) EST Model # SIGA-MCR addressable relays or approved equal

G. Programmable Relay for Elevator Shutdown: Furnish and install programmable relay(s) as needed to shut down the Elevator(s) during a fire alarm per code requirements. Relays shall be mounted adjacent to the elevator control equipment and shall be clearly labeled. Relays shall connect to the addressable loop and shall be programmed to operate as approved by the Local Authority with Jurisdiction. Unless otherwise instructed, Contractor shall program the relay to operate on if initiating devices in the elevator shaft(s) are in the alarm condition. The shutdown relay shall be interconnected with the Elevator controls to cause the elevator cab to go to the ground floor, open the doors, and shutdown. Contractor shall furnish and install any "step – up" relays as needed to support the interface with the elevator controls. The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted. Elevator shaft initiating devices shall be programmed to initiate elevator shut down relays. Relays shall be located within three (3) feet of equipment being controlled.

1. Mounting: Install in custom manufactured enclosure model # SIGA-UIO6 as identified herein
2. Furnish and install as needed EST Model # SIGA-MCR addressable relay or approved equal

H. Programmable Relay for Elevator Cab Light Control: Furnish and install programmable relay as needed to properly control the Elevator Cab Light during a fire alarm. Relays shall be mounted adjacent to the elevator control equipment and shall be clearly labeled. Relays shall connect to the addressable loop and shall be programmed to operate as approved by the Local Authority with Jurisdiction. Unless otherwise instructed, Contractor shall program the relay to operate on general alarm. Contractor shall furnish and install any "step-up" relays as needed to support the interface with the elevator controls. The use of a general alarm relay on the FACP that is not part of the addressable loop, does not meet the intent of these specifications and will not be accepted. Relays shall be located within three (3) feet of equipment being controlled.

1. Mounting: Install in an industry standard recess mounted enclosure mounted in the SIGA-UIO6 enclosure identified herein.
2. Furnish and install EST Model # SIGA-MCR addressable relay or approved equal

I. Elevator relay mounting equipment: Contractor shall furnish and install quantity one (1) SIGA-UIO6 universal mounting module that can accept up to six (6) addressable relay modules. Contractor shall furnish and install quantity one (1) MCF-A surface mount enclosure to house the SIGA-UIO6. Enclosure shall be finished in red with the words "FIRE" written in white letters. All cable shall be enclosed in minimum ¾" EMT conduit.

J. Addressable Sprinkler Alarm and Monitor Module for Flow and Tamper Switches: Furnish and install a single addressable input module to monitor both sprinkler flow alarm and a sprinkler tamper supervisory devices. This module shall be programmed to cause a general fire alarm condition upon the activation of the sprinkler flow switch. This module shall be programmed to cause a supervisory condition upon activation of the sprinkler tamper switch. The sprinkler switches shall each have a separate, supervised circuit from the sprinkler switch to the addressable module. Each circuit shall be supervised for opens and shorts using a Class "B" type end of line relay arrangement. Furnish and install one module at all locations on this project where a sprinkler flow and tamper are located. Contractor shall properly label the addressable module. Coordinate the connection of the monitor module with the sprinkler contractor.

1. Mounting: Install in an industry standard recess mounted enclosure mounted within six (6) feet form the sprinkler flow and tamper switches.
2. Furnish and install EST Model # SIGA-CT2 addressable sprinkler flow and tamper module or approved equal.

K. Addressable Sprinkler Supervisory Monitor Module for Tamper Switches: Furnish and install a single addressable input module to monitor sprinkler tamper supervisory devices. This module shall be programmed to cause a supervisory condition upon activation of the sprinkler tamper switch. The sprinkler switches shall have a supervised circuit from the sprinkler switch to the addressable module. Each circuit shall be supervised for opens and shorts using a Class "B" type end of line relay arrangement. Furnish and install one module at all locations on this project where a sprinkler tamper are located and are not covered by the above listed sprinkler flow and tamper module. Contractor shall properly label the addressable module. Coordinate the connection of the monitor module with the sprinkler contractor.

1. Mounting: Install in an industry standard recess mounted enclosure mounted within six (6) feet form the sprinkler flow and tamper switches.
2. Furnish and install EST Model # SIGA-MM1 addressable sprinkler tamper module or approved equal.

2.10 MAGNETIC DOOR HOLDERS

A. Description: Furnish and install 24Volt magnetic door hold-open devices as indicated on the project drawings. Contractor shall properly mount the recess enclosure for the door holders and attach securely to the wall. Furnish recess mounted, single gang type, 24volt magnetic door holders with steel extensions as needed to work with the "open" position of the door. The door holder circuit shall be low voltage, class II, and shall be eligible to be installed in the same conduit as the fire alarm system per local and applicable codes. Coordinate the placement, and the installation of the door holders with General Contractor as needed to allow the proper operation of the door and the door holder device.

1. Furnish and install EST Model # 1504-AQN5 recess mounted 24volt magnetic door holder or approved equal.

2.11 NOTIFICATION APPLIANCES

A. Description: Equip for mounting as indicated and have screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. All appliances which are supplied for the requirements of this specification shall be UL Listed for Fire Protective Service, and shall be capable of providing the "Equivalent Facilitation" which is allowed under the Americans with Disabilities Act Accessabilities Guidelines (ADA(AG)), and shall be UL 1971 Listed.

C. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturer's instructions.

D. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended.

E. Speaker/Strobes: Combination Notification Devices: Combination Speaker/Strobes shall mount in a single-mounting assembly using 4" square box, 2 1/8" deep with the following as a minimum.

1. Contractor shall install EST Model G4RFS7M combination speaker/strobe device as shown on project drawings.
2. Unless otherwise instructed on the project drawings, Strobe and combination speaker/strobe devices shall be installed with the bottom of the device at least 80 inches (2.0 m) and no more than 96 inches (2.4 m) above the finished floor. Horns shall be installed with their tops not less than 6 inches (152 mm) below the ceiling and not less than 90 inches (2.3 m) above the finished floor.

F. Visual Alarm Notification Devices (FIRE -Evacuation): Strobes shall mount in a single-mounting assembly with the following as a minimum;

1. Install EST Genesis Series model #G1RF-HDVM wall mounted clear lens strobes with red body and "FIRE" markings. The strobes shall mount to one-gang electrical box.
2. Unless otherwise instructed on the project drawings, Strobe and combination speaker/strobe devices shall be installed with the bottom of the device at least 80 inches (2.0 m) and no more than 96 inches (2.4 m) above the finished floor. Horns shall be installed with their tops not less than 6 inches (152 mm) below the ceiling and not less than 90 inches (2.3 m) above the finished floor.
3. Install heavy-duty, wire guards over devices as indicated on the project plans.

2.12 AUXILIARY POWER SUPPLY FOR NOTIFICATION APPLIANCES

A. Description: Contractor shall furnish and install factory fabricated auxiliary power supply designed to support fire alarm notification devices as needed to support

notification and ancillary fire alarm devices. Contractor shall provide aux power supply equipment of the same manufacturer as the control panel, field devices and notification devices.

B. Supply where needed as an extension of Notification Appliance Circuits. The extension shall be in the form of a stand-alone Booster Power supply with a minimum of 10 amps of 24 volts . The supply must incorporate its own stand-by Batteries. Batteries must be sized to correctly support the power supply for 24 hours of standby with 5 minutes of alarm. Each power supply shall be furnished with a minimum of two 12VDC, 6.5 Amp Hour Batteries.

C. The power supply must incorporate a minimum of four independent supervised Notification Appliance Circuits. It shall be possible to program the NACs to follow the main panels NAC or activate from a dry contact closure. The Booster NACs must be programmable to operate independently at any one of the following rates: Continuous 24Vdc, 120SPM, 20SPM, 3-3-3 Temporal, California, or California 120.

D. Contractor shall furnish and install quantity of EST model BPS10 notification power supplies as required to support the signal power requirement of this project with a minimum 15% spare capacity per circuit. Contractor shall furnish and install 120v circuit for each power supply.

2.13 REMOTE DEVICE LOCATION-INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: LED indicating light and key test switch near each duct smoke detector that may not be readily visible, and each sprinkler water-flow switch and valve-tamper switch. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.14 SYSTEM PRINTER

A. The event and status printer shall be a 9-pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. The printer shall be capable of serial communications protocol. The printer shall list the time, date, type and user defined message for each event printed. The printer shall be furnished and installed as shown on the plans.

B. It shall be possible to define which system event types, (alarm, supervisory, trouble, and monitor events) are sent to the system printer.

C. Contractor shall furnish and install system printer only if shown on project plans. If shown on plans, Contractor shall locate the system printer within 50’ of the system annunciator in the main office area. The printer shall be capable of connecting to any remote annunciator as well as the main system panel. Printer shall be desk mounted and use standard “form-feed” paper.

1. Furnish and install quantity one (1) EST Model # PT1S Desktop system printer located adjacent to EST3 control panel located in the main operations building.

2.15 EMERGENCY POWER SUPPLY

A. General: Components include sealed lead acid batteries, charger, and an automatic transfer switch.

1. Battery Nominal Life Expectancy: 5 years.

B. Battery Capacity: Comply with NFPA 72.

C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

D. All batteries shall be a minimum of 12Volt, 10 Amp-Hour for the control panel and 12 Volt 7 Amp Hour for all auxiliary power supplies.

E. Back Up Power: System shall be supplied with battery back up to support 24 hours of supervision followed by 5 minutes of alarm as minimum. Battery calculations for the control panel and signal power supplies shall be included with equipment submittal.

F. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.16 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the protected device as indicated on project drawings.

1. Factory fabricated and furnished by the manufacturer of the device.
2. Finish: Paint of color to match the protected device.

2.17 INSPECTION BAR CODES

A. Description: Contractor shall include all costs needed to utilize factory authorized service organization to furnish and install inspection bar code labels on each fire alarm device prior to project completion. Contractor shall furnish and install inspection bar codes on all fire alarm equipment including but not limited to each fire alarm or mass notification;

1. initiating device
2. supervisory device
3. notification device
4. annunciator
5. control panel
6. power supply
7. all other fire alarm equipment attached to the fire alarm system

B. Contractor shall utilize inspection bar code labels that include Code 3 or Code 9 or other approved format and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web Based Reporting System. There shall be no

duplication of serial numbers. Serial numbers shall be printed below the bar code for identification purposes.

C. Inspection bar code labels shall be limited in size to no more than 2" wide and 3/8" high and shall include a Mylar or other protective coating to protect the bard code from fading due to sunlight or exposure.

D. Inspection bar codes shall be installed on each fire alarm device in such a manner as to require the scanning of the bar code take place no further than 12" from the device during inspection.

2.18 WIRE

A. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Data Circuits: No. 18 AWG, minimum.
2. Low-Voltage Circuits: No. 14 AWG, minimum.
3. Line-Voltage Circuits: No. 12 AWG, minimum.

B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connect the FACP with a circuit breaker with lockable handle or cover.

B. Manual Pull Stations: Mount semiflush in recessed back boxes. Mount with top of box 48" above finished floor.

C. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

D. Ceiling-Mounted Smoke Detectors: Not less than 4 inches from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of roof deck. On smooth ceilings, install not more than 30 feet apart in any direction.

E. Wall-Mounted Smoke Detectors: At least 4 inches, but not more than 12 inches, below the ceiling.

F. Smoke Detectors near Air Registers: Install no closer than 60 inches.

G. Duct Smoke Detectors: Comply with manufacturer's written instructions.

1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
2. Install sampling tubes so they extend the full width of the duct.
3. Provide as many detectors as required to suit final duct arrangement.

H. Audible Alarm-Indicating Devices: Install each audio-visual horn/strobe with top of box 80” above finished floor or 6 inches below the ceiling, whichever is lower. Install horn/strobes and strobes recess mounted with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit. Indicating devices shall not be further than 15’ from the end of a corridor.

I. Visible Alarm-Indicating Devices: Install each alarm visual-strobe at least 6 inches below the ceiling and not more than 80” above floor.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

K. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.

L. Annunciator: Install with the top of the panel 60 inches above the finished floor.

M. Install wire guards on all devices as indicated on drawings.

N. Equipment exposed to direct rain/weather shall be water resistant type as needed.

3.2 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated. Provide surface metal raceways in areas of existing masonry construction.

B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Addressable Circuit Cable: Addressable data cable shall be #18AWG as a minimum, meet the manufactures requirements, shall be UL listed for use as a fire alarm cable, and shall be enclosed in a ¾” minimum EMT raceway.

E. Notification – Signal Circuit Cable: Signal Circuit notification cable shall be #14AWG as a minimum, meet the manufactures requirements, shall be UL listed for use as a fire alarm cable, and shall be enclosed in a ¾” minimum EMT raceway.

F. Ancillary Control Circuit Cable: Other cable used in conjunction with the fire alarm system such as low voltage HVAC damper control circuits, low voltage door holder circuits, low voltage elevator recall circuits, or any other low voltage shall be #14AWG as a minimum, meet the manufactures requirements, shall be UL listed for use as a fire alarm cable, and shall be enclosed in a ¾” minimum EMT raceway.

G. Remote Annunciator Circuit Cable: Remote annunciator data cable shall be one pair #18AWG as a minimum, meet the manufactures requirements, shall be UL listed for use as a fire alarm cable, and shall be enclosed in a ¾" minimum EMT raceway. Cable shall be West Penn #980 or equal.

H. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines. Owner is responsible to furnish a Central Station monitoring service UL Listed for commercial fire alarm applications to monitor the fire alarm system. Contractor shall furnish and install quantity two (2) CAT5, plenum rated cables from the Fire Alarm Control panel to the main incoming telephone service "point of demarcation" punch down equipment. This system shall share two (2) of the Owner's telephone lines and utilize "line seizure" as needed as defined by USOC standard RJ31X style telephone receptacles. These telephone lines shall not be dedicated for fire alarm use.

I. Code Compliance: All cable used shall meet the minimum requirements of all the following; NFPA, NEC, UL, Authority with local jurisdiction, and the manufacturer's written requirements.

J. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply circuit breaker switch red and label "FIRE ALARM."

3.4 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 16 Section "Grounding."

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to procedures outlined in currently adopted version of NFPA 72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

H. Certification: The system shall be certified for proper installation and operation by a factory certified technician employed by an authorized sales and service distributor for this project location.

I. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.6 SYSTEM OPERATIONAL DATA FILES

A. Contractor shall include all costs associated with having fire alarm system programmer provide CD of site specific data files following acceptance by the Authority Having Jurisdiction. Contractor shall be held responsible for delivery of current fire alarm data files on CD to Owner's representative. Any subsequent changes to the data files within the warranty period shall be copied to a CD and delivered to the Owner's representative. Failure to provide this required information shall prevent Contractor from receiving final payments.

B. Contractor shall include all costs associated with having fire alarm system final testing for NFPA utilize barcode scanner and documentation of each device showing time devices was tested and results. Documents shall be printed and submitted in hardcopy and shall remain available online in a web based storage facility with password protection. Web based test reporting shall be equal in all respects to that available by Building Reports company.

3.7 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules.
2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. At the completion of the system installation, certification, and training the system data files representing the custom program of this system shall be turned over to the Owner and become property of the Owner. These data files shall be submitted using digital file(s) stored on a CD without passwords or encryption or any other obstacle preventing an authorized service technician from having direct access to the data files. Paper submission is not acceptable. The fire alarm system shall not be accepted until this information is turned over to Owner.
4. Schedule training with Owner, through Architect, with at least seven days advance notice.

3.9 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION 283100

SECTION 287890 – INTEGRATED SECURITY MANAGEMENT SYSTEM (ISMS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 RELATED SPECIFICATION SECTIONS

A. Raceways and Boxes for Electrical Systems: Division 26 Section 260533

B. Fire Stopping Penetration Through Rated Construction: Division 07 Section 078413

C. Low-Voltage Electrical Power Conductors and Cables: Division 26 Section 260519

D. Door Hardware: Division 08 Section 087100

1.3 SUMMARY

A. The Contractor shall include all necessary wiring, cabling, labor, tools, equipment, and ancillary materials required to provide a complete and operational ISMS.

B. Requirements are indicated elsewhere in these specifications for work including, but not limited to:

1. Must interface to the existing enterprise system and dedicated security network at the existing district headquarters.
2. Provide additional FC Wnx enterprise level software and SQL licenses as necessary to support the server, workstation, readers and client workstation expansion counts as per drawings.
3. Shall be able to read cards into existing District 1 Headquarters as well as West Virginia wide ISMS managed from the Capitol.
4. Conduit, 110 VAC power extensions, and other electrical work.
5. Electric door hardware, egress devices, Maglock power supplies and battery backup for card reader doors shall be furnished and installed by Division 8 contractor unless otherwise specified.
6. The Contractor shall provide a dedicated local area network for the connections as shown on the attached drawings for IP cameras, Avigilon NVMS server and workstations, Facility Commander Wnx access control server and work stations, control panels and Interlogix intrusion panel with Network card. NVMS server, access control server and work stations to be located as per drawings. Contractor to locate switch and server in contractor provided rack as per specification. Rack must be a minimum of 36 inches deep. *See rack specification section.*

C. The ISMS shall provide management, control, and monitoring of card access and alarms, locally and at remote headquarter sites. It shall integrate with the IP camera

network video management system (NVMS) via *OEM API interface* and intrusion system via *Osbourn Hoffman software interface*.

1. The intrusion system will be monitored by the Department of Protective Services, provide as required for interfacing with the Facility Commander/Osbourn Hoffman receiver.

D. The extent of ISMS work is defined to include but not limited to the following:

1. The ISMS client software shall be installed on PC and located as per drawings, with minimum 24 inch desktop monitor and connected to the dedicated security LAN.

E. Installing the ISMS and bringing it to operational status for acceptance shall include but not limited to the following:

1. Determine hardware, software, and operations requirements for implementation.
2. Install ISMS hardware and software.
3. Setup and configure communications between the host server, operator workstations, and control panels. Provide workstations as per drawings.
4. Setup and configure ISMS application and database.
5. Test ISMS operations based on a point-by-point walkthrough inspection.
6. Perform end-user training – demonstrate how to:

    a. Add credentials
    b. Add schedules
    c. Add Maps
    d. Backup database
    e. Add roles
    f. Manage Identities
    g. Add Alarm trigger to tag video
    h. System Integrator to configure:

        1) Basic system parameters

            a) Add 1 user and 1 administrator account
            b) Up to 4 schedules based on owner input
            c) 1 map provided by Owner with device overlays
            d) 1 trigger event for sample video pop up
            e) Owner to add additional users, badges, roles, schedules, maps, alarm triggers

F. This section covers the provision of ISMS including, but not limited to all items and subsystems shown on drawings or otherwise required by these specifications.

1. ISMS computer hardware, software, and control panels for access control and alarm management.
2. Power over Ethernet (POE) Switches
3. Card readers and other security input/output devices for access control and alarm monitoring of secured areas
4. Automatic Doors & Operators
5. Vehicle Access & Parking Gate Operators
6. Video Surveillance System and Cameras
7. Video Recorders
8. Intrusion Detection System

9. Video Management Software

1.4 DEFINITIONS

A. CCTV: Closed-circuit television.

B. CPU: Central processing unit.

C. Credential: Data assigned to an entity and used to identify that entity.

D. dpi: Dots per inch.

E. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

F. GFI: Ground fault interrupter.

G. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

H. I/O: Input/Output.

I. LAN: Local area network.

J. Location: A Location on the network having a PC-to-controller communications link, with additional controllers at the Location connected to the PC-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

K. PC: Personal computer. Applies to the central station, workstations, and file servers.

L. PCI Bus: Peripheral Component Interconnect. A peripheral bus providing a high-speed data path between the CPU and the peripheral devices such as a monitor, disk drive, or network.

M. PDF: Portable Document Format. The file format used by the Acrobat document-exchange-system software from Adobe.

N. POE – power over Ethernet

O. RAS: Remote access services.

P. RF: Radio frequency.

Q. ROM: Read-only memory. ROM data are maintained through losses of power.

R. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

S. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

T. UPS: Uninterruptible power supply.

U. USB: Universal serial bus.

V. WAN: Wide area network.

W. WAV: The digital audio format used in Microsoft Windows.

X. WMP: Windows media player.

Y. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

Z. Windows: Operating system by Microsoft Corporation.

AA. Workstation: A PC with software that is configured for specific, limited security-system functions.

BB. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and provided specialties and accessories. Reference each product to a location on Drawings.

B. Executive Summary System Description: Descriptive statement and single-line block diagram to show how all related equipment will interface and operate as a complete ISMS.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. All shop drawings shall be prepared in AutoCAD software. In addition to the drawings, the Contractor shall provide a diskette containing the identical information. Drawings shall be B size or larger.

D. Shop drawings shall include:

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for server, workstations, and controllers.

E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.

1.6 SYSTEM OPERATING AND MAINTENANCE MANUALS

A. Contract Close-Out Submittals:

1. Training Course Materials: Specified elsewhere in this document.
2. Commissioning Test Plan and Check-Off List: Specified elsewhere in this document.
3. As-Built Drawings: Copies of the final as-built drawings shall be provided to the owner in DXF format using the latest version of AutoCAD.

B. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire Integrated Security System. This documentation shall include specific part numbers and software versions and dates. A complete list of recommended spare parts shall be included with the lead time and expected frequency of use of each part clearly identified.

C. Following project completion and testing, the Integrated Security Management System Vendor will submit as-built drawings reflecting the exact installation of the system. The as-built documentation shall also include a copy of all application software both in written form and on diskette.

D. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017839 "Project Record Documents," include the following:

1. Microsoft Windows software documentation.
2. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals.
3. Hard copies of manufacturer's specification sheets.

1.7 WARRANTY AND MAINTENANCE

A. The ISMS software, hardware, and installation shall be warranted against defects and workmanship for a minimum of 12 months covering all parts and labor, after acceptance by Owner.

B. The Contractor shall guarantee that the ISMS application software/firmware remains current at all times during the warranty period with the latest enhancements, and is supported by the ISMS manufacturer with unlimited remote diagnostics capability and technical phone support.

C. The Contractor shall perform manufacturer’s recommended preventative maintenance on all applicable components and/or devices. (requires a service contract)

D. The Contractor shall be the primary contact and respondent for all service and support and officially recognized and backed by the ISMS manufacturer.

E. Extended and/or out of warranty terms at reasonable and customary rates shall be available from the Security Contractor.

F. Provide a separate proposal for a Software Support Agreement and maintenance/inspection service contract for consideration by Owner.

1. Length of Contract: 3 years.
2. Submit payment terms and conditions with proposal.

G. Updates to the manufacturer's software shall be provided at no charge during the warranty period.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70, "National Electrical Code."

E. Comply with NFPA 101, "Life Safety Code"

F. All equipment or wiring used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.

G. Comply with National Electrical Manufacturers Association (NEMA).

H. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.

I. UL-294 Listed Access Control Systems.

J. UL-1076 Listed Line Supervision.

K. Comply with NIST Triple DES Certificate #206

L. Comply with Americans with Disabilities Act (ADA).

M. Comply with all applicable National, State and Local Codes.

1.9 SECURITY SYSTEMS COORDINATION

A. Coordinate the installation, operation and control of the whole building ISMS with the Owner's Rep.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Central Station, Workstations, and Controllers:

1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F, and not more than 80 percent relative humidity, noncondensing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This specification is based on software and hardware manufactured by Lenel/UTC/GE Security; 791 Park of Commerce Boulevard, Boca Raton, FL 33487 USA. Tel: (561) 998-6100, Fax: (561) 994-6572.

B. Provide all ISMS access control hardware and software as standard catalog product offering of a single manufacturer.

C. Servers, workstations, and related computing peripherals shall be specified characteristics that are in regular production by an industry recognized computer manufacturer, provided that replaceable components are available from multiple third party sources.

D. Controlled devices, such as electric locks, door actuators, power supplies etc., are specified elsewhere and provided by OTHERS.

E. Other manufacturers seeking approval must provide the following information to the Architect 14 days PRIOR TO BID. If approved, written notification will be provided to all bidders of record; verbal approvals are not valid.

F. Detailed bill of materials, correlating each item of equipment and software to those specified.

G. Manufacturer's standard published catalog data sheet for each proposed item of equipment and software; if more than one model is shown on data sheet, mark exactly which model is being proposed.

H. Copy of this specification with each paragraph marked to show where on the data sheets the specification requirement specified in that paragraph is stated (use cross-reference numbers on data sheets).

I. If compliance with any specification requirements cannot be substantiated by reference to published data, provide typewritten compliance statement signed by executive officer of manufacturer stating that proposed products comply with all specified requirements.

2.2 SYSTEM REQUIREMENTS

A. ARCHITECTURE:

1. The ISMS shall be a Microsoft Windows based client/server application capable of integrating multiple security functions including management, control, and monitoring of access control, alarms, photo ID credentialing, interfacing with video surveillance, other security subsystems and business database applications.
2. The ISMS shall be a true 32bit multi-threaded application, designed for Microsoft Windows technology platforms; with multi-user and multi-tasking capability, developed in a high level "C" language.
3. The ISMS shall use a commercially available standard database that is SQL and ODBC compliant, certified for the Microsoft Windows platform.
4. The ISMS shall support user definable record-level database partitioning, for defining limited views of the ISMS database.
5. The ISMS database shall support open direct database connectivity for importing cardholder and card ID data from external systems and/or database applications. The ISMS shall facilitate interfacing by providing the following capabilities:
6. Real time and batch processing of data via ODBC, JDBC or OLE DB over a network connection.
7. Insert, update, and delete record information.
8. Automatic download of data to ISMS control panels based on database changes.
9. Provide audit trail in the operator history/archive database for all database changes initiated by the interface.
10. The ISMS be capable of operating in a Microsoft SQL Server Cluster environment where the ISMS application server(s) support a shared database cluster. Cluster management shall be provided by industry standard Microsoft clustering services and should not require any proprietary clustering software.
11. It shall be possible to separate the ISMS database from the ISMS application including deployment of the database and application in separate geographical locations and communicating over standard network infrastructure to provide maximum flexibility and conformance to IT data center standards.
12. The ISMS shall be capable of supporting database and file replication using Microsoft SQL Server Replication Services and Microsoft File Replication Services for providing distributed database replication across multiple ISMS application servers allowing for system expansion and delivering N tiers of server redundancy. Database and file replication shall not require any proprietary database or file replication software.
13. The ISMS shall conform to the standard TCP/IP networking communications protocol between the application server(s), client workstations, control panels, video surveillance system(s) and database subsystems, using 10/100MbEthernet connectivity over LAN/WAN network typologies.
14. The ISMS shall be flexible and scalable in architecture, permitting expansion of both capacity and functionality, to be implemented progressively as needed, through software licensing and/or software upgrades.
15. The ISMS shall provide the ability to perform network deployed software updates. Network deployed updates shall have the option to be deployed manually or automatically.
16. The ISMS shall provide a real-time display of all system status and data at all operator workstations.
17. The ISMS shall monitor status and record activity transactions of all secured areas and alarm input/output points; visually and audibly annunciate alarms upon change of status, for assessment and response at all operator workstations.
18. The ISMS shall monitor and record card access, alarm, and operator activity to an online history/archive database for reporting.
19. The ISMS shall employ distributed processing technology, allowing the host to function almost entirely as an application/database server. The majority of the real time, day-to-day decisions shall be made locally by intelligent control panels.

The control panels shall be the direct field interface for all access control, alarm sensing, and input/output-controlled devices.

20. Each control panel shall be able to continue access control and alarm-monitoring operations autonomously, in the event of ISMS hosting failure or network segment outage.
21. The ISMS shall manage and automatically download in real-time, all database changes made at all operator workstations, to the control panels that require notification of the specific database changes or updates.

B. System Redundancy & High Availability: The ISMS is capable of providing multiple levels of communications redundancy and failover for all ISMS hosted controllers, digital video recorders, API service connections, and client workstations. The ISMS shall be capable of automatically re-routing communications to alternate ISMS computers across the system without operator intervention.

1. ISMS system configurations with a single application/ database server shall provide at a minimum the following redundancy and failover capability:
2. The ISMS shall provide communications redundancy and failover for network-attached devices. Each network attached device (Control Panels, Digital Video Recorders, and API service connections) shall have one or more alternative communication sever(s) that can provide hosting in case of primary communications server failure.
3. In case of primary communications server failure, the system shall automatically re-route network-attached devices to their designated backup communications servers to allow continuous system operations without loss of alarm and event transaction processing during failover.
4. Network-attached devices which transition to backup communications servers, shall be able to be redirected back to their default primary servers, once the primary communications servers have been restored.
5. ISMS system configurations with multiple regional application/ database servers shall provide at a minimum the following redundancy and failover capability:
6. The ISM shall support the same level of communications redundancy and failover for network-attached devices per regional application/database server, allowable to span across regional application/database servers in the event of a regional application/database server failure.
7. In case of a regional application/database server failure, client workstations shall be able to failover to their designated backup regional application/database server to allow continuous system operations.
8. In case of a regional application/database server failure, upon server restoration, the ISMS shall automatically update and synchronize the regional application/database server.
9. Client workstations which transition to a backup regional application/database server, shall be able to be redirected back to their default regional application/database server, once the regional application/database server functions have been restored.

C. System Capacity: Provide total system capacity to accommodate the following:

1. Application/Database Servers: Must be capable of supporting a Single application/database server upgradeable to a multi-server configuration with up to 64 synchronized application/database servers operating as a single unified system.
2. Workstations: Must be capable of supporting a minimum of 5 concurrent operator workstation sessions per server upgradeable to 50 concurrent operator workstation sessions per server.

3. Cardholder Database: Must be capable of supporting a minimum of 25,000 access control cards upgradeable to 500,000. Multiple access control cards assignable per cardholder, each tracked separately. Access control cards shall be unique 4 to 16-digit numbers without facility code dependency.
4. Control Panels: Must be capable of supporting a minimum of 64 per server upgradeable to 1,024 per server
5. Access Control Readers: Must be capable of supporting a minimum of 256 readers per server upgradeable to 4,096 readers per server.
6. General Purpose Alarm Inputs: Must be capable of supporting a minimum of 2,560 alarm input points per server upgradeable to 20,048 per server.
7. General Purpose Outputs: Must be capable of supporting a minimum of 2,048 relayed or TTL level output points per server upgradeable to 16,384 per server.
8. Time Schedules: Unlimited definable in system database, up to 1,024 concurrently active per control panel.
9. Access Rights: Unlimited definable in system database, up to 96 concurrently active per access card per control panel.
10. Transactions: Centralized on-line storage of historical transactions, a minimum of 1,000,000 events
11. Digital Video Recorders: Must be capable of supporting a minimum of 16 per server upgradeable to 256 per server
12. Video Surveillance Cameras: Must be capable of supporting a minimum of 256 per server upgradeable to 4,096 per server.

D. Control Panel Capacities:

1. Field configurable control panel:

    a. Card Readers: Capable of supporting up to 16 card readers.
    b. General Purpose Alarm Points: Capable of supporting up to 80 four-state supervised alarm input points.
    c. General Purpose Outputs: Capable of supporting up to 64 relay or TTL level output points.
    d. Access Control Card Memory: Up to 100,000
    e. Offline-History Transaction Buffer: Up to 16,000
    f. Time Schedules: Up to 1,024
    g. Access Rights: Up to 96 per access control card per panel
    h. Uninterruptible Power Supply: Battery rated for a minimum 4 hours of continuous operation at full load.

2. Fixed configuration control panel:

    a. Card Readers: Support 4 card readers.
    b. General Purpose Alarm Points: Support 10 four-state supervised alarm input points.
    c. General Purpose Outputs: Support 8 relay output points.
    d. Access Control Card Memory: Up to 100,000.
    e. Offline-History Transaction Buffer: Up to 16,000.
    f. Time Schedules: Up to 1,024.
    g. Access Rights: Up to 96 per access control card per panel.
    h. Uninterruptible Power Supply: Battery rated for a minimum 4 hours of continuous operation at full load.

E. Operator Interface:

1. The ISMS shall use a single Windows based client application interface for system configuration, administration, management, and monitoring operations.
2. The ISMS shall provide a mouse-driven, Windows based, graphical user interface allowing operator(s) to open and work on multiple windows simultaneously, at host server and client workstation(s) with minimal degradation to system performance.
3. The ISMS shall provide on-line context sensitive help files to facilitate operators in the configuration and operation of the ISMS. Standard Windows help commands for Contents, Search, Back, and Print shall be supported.
4. The ISMS shall implement National Language Support (NLS) in a manner that allows simultaneous multi-lingual operation, based on individual operator language preference. The graphical user interface and on-line help shall support English and [Spanish] [French] [Portuguese] [Italian] [German] [Chinese] [Korean] [Japanese].
5. The ISMS shall support defining an unlimited number of operators; application access via workstation(s) shall be restricted by operator login and password. Operator passwords shall be stored in the database in an encrypted manner. The ISMS shall provide that ability to setup password rules for password length and expiration periods for system operators. Operator profiles shall be configurable to include form level permissions, database partition views, and language preference.
6. The ISMS shall allow operator authentication through an Active Directory Server, bypassing ISMS storing passwords. Operator access with the ISMS shall continue to be defined within the ISMS configuration forms.
7. The ISMS shall support the use of thin client application deployment to provide remote access to the Operator Interface. Thin client application support shall be via standard Microsoft Terminal Services, Citrix MetaFrameXP and Microsoft Virtual Terminal Services using a standard web browser

F. Cardholder Management:

1. The ISMS shall provide an operator interface for enrollment, modification, and deletion of cardholder's personnel and access control information. The ISMS shall allow enrollment of cardholder's personnel and access control information in advance, without requiring assignment of access control card(s). The ISMS shall provide the ability to select multiple cardholders and badge records in applying mass changes. The cardholder's personnel and access information shall include the following data:

    a. First Name.
    b. Middle Name 1.
    c. Middle Name 2.
    d. Last Name.
    e. Employee Number.
    f. Personnel Type (Selectable from a user defined list that shall include at a minimum; Permanent, Temporary, Contractor, and Visitor classifications).
    g. Department (Selectable from a user defined list).
    h. Facility (Selectable from a user defined list of database partitioned views).
    i. Trace Activity (Enable/Disable).
    j. Address 1 (User definable label).
    k. Address 2 (User definable label).
    l. Address 3 (User definable label).
    m. Address 4 (User definable label).
    n. Address 5 (User definable label).
    o. Telephone.

p. 90 User Fields (User definable labels).
q. Access Right(s) (Multiple assignments).
r. Access Card(s) (Multiple assignments).

G. Card ID Management:

1. The ISMS shall provide an operator interface for enrollment, modification, and deletion of access control card ID information in advance, without requiring assignment to a cardholder and shall include the following data:

a. Description.
b. Card ID number (4 to 16 digit, unique access control identifier).
c. Pin Number (4 digit number for authenticating cardholder in card & keypad reader applications).
d. Status (Issuable, Active, Lost, Suspended, Remake).
e. Assigned Cardholder (Selectable from predefined list of cardholders).
f. Issue Date (Required to support advanced date issuance with automatic activation of access control card ID numbers at control panel level in real-time without ISMS host notification).
g. Return Date.
h. Expire Date (Required to support out to year 2099 and automatically expire access control card ID numbers at control panel level in real-time without ISMS host notification).

H. Access Control Management:

1. The ISMS shall allow or deny access to secured areas, arm and disarm intrusion zones, and provide output control via access control readers, based on validation of a cardholder's assigned access rights.
2. The ISMS shall support defining an unlimited number of access rights in a manner that associates reader(s) with a specific time schedule. The time schedule shall define the specific time(s) of day and day(s) of the week for which access will be granted for the associated reader(s) and/or controlled output(s).
3. The ISMS shall allow cardholders to be assigned multiple access rights and multiple access control cards, without requiring duplicate database entry of cardholder personnel information.
4. Any and all access control cards assigned to a cardholder, shall automatically inherit all of the access rights assigned to the cardholder.
5. The ISMS shall monitor all secured areas and process an alarm notification whenever a reader controlled door is opened, unless door is opened pursuant to a valid card read, exit request through egress device, or door has been manually unlocked via remote command from an authorized system operator.
6. The ISMS shall be user configurable to operate in either global or local mode, controlling IN and OUT access of secured areas for anti-passback and time & attendance applications.

I. Time Schedule and Mode Management: The ISMS database shall support defining an unlimited number of schedules. Schedules shall define time, day, and date intervals for automatically executing ISMS functions, events, and mode changes.

1. Time schedules: Shall define start and stop interval(s) by time of day and day of week or mode. Each time schedule shall support multiple intervals per day and multiple days per week. Time schedules shall be applicable to the following ISMS functions:

a. Cardholder access rights to secured areas.
b. Readers online/offline.
c. Doors lock/unlock.
d. Alarm monitoring on/off.
e. Inputs enabled/disabled.
f. Outputs on/off.
g. Transaction routing for alarm and card activity.

2. Event Schedules: Shall define specific time(s) for an event to occur by time of day and day of week or mode. Each event schedule shall support multiple events per day and multiple days per week. Event schedules shall be applicable to the following ISMS functions:

a. Changing reader modes of operation between card only, card-plus-keypad, and card or keypad.
b. Changing alarm monitoring sense times.
c. Resetting anti-passback and/or time and attendance IN/OUT status of all cardholders in control panel databases.
d. Initiating a scheduled dial from host to communicate to remote dial-up control panels.

3. Mode Schedules: Shall define specific times and dates for indicating to system control panels which time and event scheduled functions to execute.

a. A minimum of 4 distinct mode classifications will be supported for categorizing time and event scheduled functions. Mode classifications shall include Normal and 3 user definable modes such as holiday, evacuation, lock-down, or others.
b. Mode changes can either be scheduled to occur at a specific date and time or manually changed by an operator.

J. Reader / Door Control:

1. The ISMS shall allow access control readers to be individually configured for different applications and modes of operation and shall support the following:

a. Physical Reader Type: Each reader's physical mode of operation shall allow to be manually changed by an operator, or automatically via a system event schedule, for increasing or decreasing the level of security required for accessing secured areas at any time.

1) Card Only.
2) Card-plus-keypad.
3) Card or Keypad.

b. Logical Reader Type: Each reader's logical mode of operation shall be configurable to support the following:

1) Normal.
2) Anti-passback IN, configurable to operate in enforced or passive mode.
3) Anti-passback OUT, configurable to operate in enforced or passive mode.
4) Time & Attendance IN, configurable to operate in enforced or passive mode.

5) Time & Attendance OUT, configurable to operate in enforced or passive mode.
6) IN Required, configurable to operate in enforced or passive mode.

c. Maximum unlock time after a valid card read shall be configurable from 0 to 59 minutes and 59 seconds.
d. Alarm sense time for allowing a door to remain open after a valid card read, before reporting a door held open alarm, shall be configurable from 0 to 61minutes and 59 seconds.
e. Extended unlock /alarm sense time after a valid card read shall be configurable from 0 to 59 minutes and 59 seconds, for cardholders requiring extended unlock duration times as in ADA applications. Cardholders and individual credentials for cardholders shall be configurable to initiate Extended unlock/sense functionality on doors configured to do so.
f. "Toggle" Card Reader: In addition to normal time duration control, the system shall support configuring readers to switch between on /unlock and off/locked with each valid card read.
g. Door relock after a valid card read shall be configurable to support the following:

1) Lock on duration.
2) Lock on open.
3) Lock on close.

h. Reader / Door State:

1) Each reader shall support operating in a default on-line or off-line state, allowing to be manually changed by an operator, or automatically under a time of day and day of week schedule.
2) Each door shall support operating in a default locked or unlocked state, allowing to be automatically changed under a time of day and day of week schedule.
3) Each door, when scheduled to automatically unlock, shall be individually configurable to additionally require a valid card transaction to occur first before automatically executing the door unlock schedule.
4) Each door shall be individually configurable to monitor aperture of the door after a valid access grant, validating actual passage of the cardholder for accurately managing individual card IN & OUT status.

i. Reader Transaction Routing:

1) Transactions for valid, invalid, and lost cards from each reader shall be independently configured for default routing to history/archive, system printer, and/or all operator workstations.
2) Valid card transaction from each reader shall be independently configured to support routing under time of day and day of week schedule to history, system printer, and/or all operator workstations.

K. Input/Output Control

1. The ISMS shall allow control panel input and output points to be individually defined, configured, and controlled in the following manner:

a. Input point(s) shall be user configurable for specific applications. The following application types shall be supported:

1) Alarm: digital input used to trigger an alarm and any selected output.
2) Digital Output: digital input used to trigger a selected input without alarm notification.
3) Elevator: digital input used for elevator control.
4) Inactive: digital input is disabled.

b. Input point(s) shall support a user configurable sense time from 0 to 59 minutes and 59 seconds. Sense time changes shall be supported via event schedules.
c. Input point(s) shall allow the active state to be configured as open or closed.
d. Input point(s) shall be user configurable to control a primary and/or secondary output. Input point(s) configured for output control shall allow being enabled or disabled via time schedule.

1) The primary output shall be configurable to follow the input point's state change or activate for its defined output duration.
2) The secondary output(s) shall be configurable to follow the input point's state change or remain activated until manually reset or scheduled off.

e. Output point(s) shall support a user configurable duration time from 0 to 61 minutes and 59 seconds.
f. Output point(s) shall allow the active state to be configured as on or off.
g. Output point(s) shall be automatically controlled via time schedule to turn on or off.
h. Output points shall allow grouping to facilitate activating multiple output points, on or off, via time schedule.
i. Output point(s), including reader controlled doors, shall allow manual control by authorized operators in the following manner:

1) Activate/unlock for duration.
2) Activate/unlock indefinitely.
3) Deactivate/Lock.
4) Schedule override.
5) Text entry explaining reason for manual operator control shall be recorded in operator history/archive database.

L. Alarm Management

1. The ISMS shall allow alarms to be individually defined, configured, and controlled in the following manner:

a. Configure if monitoring of the alarm is enabled or disabled. An alarm shall allow monitoring to be controlled manually by an authorized operator and automatically via time schedule.
b. Alarm(s) shall be user configurable to trigger primary and/or secondary output(s).

1) The primary output shall be configurable to follow the alarm's state change or activate for its defined output duration.
2) The secondary output shall be configurable to follow the alarm's state change or remain activated until manually reset or scheduled off.

c. Alarms shall allow grouping to facilitate monitoring multiple alarms, on or off, via time schedule and changing alarm sense times via event schedules.
d. Alarms shall support regrouping via event schedules, allowing alarms to be reassigned to different alarm groups.
e. Configure if the alarm shall be routed to the history/archive database and/or printed on a host/server alarm printer.
f. Alarms shall be able to be routed to specific workstations on specific time schedules. If an alarm is not responded to within a definable time period, it shall be able to be bumped to another workstation for acknowledgement.
g. User-definable instructions shall be assignable to each alarm, required to display in the alarm monitor window at all operator workstations for alarm assessment and response.
h. Configure if operator acknowledgement of the alarm is required before the alarm can be cleared from the alarm monitor window from any operator workstation.
i. 20 priority levels for prioritizing the processing and display of alarms.
j. Configure and assign different foreground and background colors for the alarm text from a palette of 256 different colors, based on the alarm priority and state (Alarm, Reset, Bumped Alarm, Bumped Reset).
k. E-mail Alarm Notification: The ISMS shall be capable of providing Alarm notification to email address(s) or devices using a SMTP messaging protocol.

M. System Monitoring: The ISMS shall provide multiple monitoring application windows dedicated for displaying real-time information of ISMS card access and alarm activity as well as control panel and operator workstation status.

1. Activity Monitor: shall display card access and non-alarm event activity from all ISMS readers and relevant security devices that are on-line, active, and configured to route to monitor. The monitor window shall provide operator controls to clear, pause, and resume scrolling display of activity transactions. The following system activity transaction information shall be displayed:

a. Transaction date & time
b. Access Control Transaction types:

1) Valid (Access granted).
2) Valid Open (Access granted with door aperture confirmation).
3) Valid No Passage (Access granted with no door aperture detected).
4) Invalid (Access not granted).
5) Invalid Pin (Access not granted).
6) Max Invalid PIN (Access not granted, card suspended).
7) Suspended Card (Access not granted).
8) Lost Card (Access not granted).
9) Unknown Card (Access Not Granted).
10) Duress Valid.
11) Duress Invalid.
12) Duress Valid Open.
13) Duress Valid No passage.
14) Anti-Passback IN Invalid.
15) Anti-Passback OUT Invalid.
16) Time & Attendance IN Invalid.
17) Time & Attendance OUT Invalid.

c. Cardholder name.
d. Card ID number for unknown or unassigned cards.

e. Intrusion Zone Area Transaction Types:

1) Zone Armed.
2) Zone Disarmed.
3) Arm/Disarm Failed, Zone Not Secure.
4) Arm/Disarm Failed, Invalid Access Right.
5) Arm/Disarm Failed, Not in Zone.

f. Guard Tour transaction Types:

1) Tour Started.
2) Tour Ended.
3) Tour Activity Valid.
4) Tour Activity Invalid.
5) Tour Paused.
6) Tour Resumed.

g. Source device location description & reference.
h. The ISMS shall allow direct navigation from any event within the Activity Monitor to its related call-up of live and recorded video playback.

2. Alarm Activity Monitor: shall display alarm activity for all ISMS alarms configured or scheduled as monitored. The alarm activity monitor shall provide alarm notification and interaction for alarm assessment including acknowledgement and response. All operator acknowledgements and responses shall be recorded in the operator and alarm history/archive database. The following alarm activity information shall be displayed:

a. Priority.
b. Description.
c. Reference type or additional alarm information.
d. Alarm state:

1) Alarm.
2) Reset.
3) Cut (Tamper supervision).
4) Short (Tamper supervision).

e. Process state:

1) Acknowledged.
2) Unacknowledged.

f. Occurrence Count.
g. Host date and time.
h. Control panel date and time.
i. Predefined alarm instructions for operator assessment.
j. Entry for operator alarm response in free form text and from pick list of predefined alarm responses.
k. Acknowledgement button.
l. Alarm notification shall be provided via pop-up dialogue notifying the operator of the occurrence of a new alarm. Direct navigation from the notification dialogue to the Alarm Activity Monitor shall be provided.

m. The ISMS shall allow direct navigation from any alarm within the Alarm Activity Monitor to its related call-up of live and recorded video playback as well graphics map location.

3. Control Panel Monitor: shall provide real-time communications status and connectivity control of all ISMS control panels. The control panel monitor shall support and provide the following:

   a. Display control panel properties, firmware version, and communications status.
   b. The ability to remotely reset, configure online/offline, force database downloads, and update control panel firmware.

4. Client Workstation Monitor: shall provide real-time communications status and connectivity control of all ISMS servers and client workstations.
5. Alarm Graphics Monitor: The system shall provide graphical map creation, editing, and real-time monitoring software for command & control visualization of ISMS alarms and device states via user configurable multi-state device symbols or icons.

   a. The following ISMS components shall be represented on graphics maps for monitoring and control: area/zones, cameras, client workstations, controllers, digital inputs, digital outputs, digital video recorders, reader, control points, and command groups.
   b. The ISMS shall allow a group of same or different devices to be represented by a single icon as a control point, such that the group is treated as a single object for alarm status purposes.
   c. The ISMS shall allow multiples of the same device type for the purpose of executing a single command on all the devices in the command group. Each command group icon can be defined as all devices of that type on the map, all devices of that type in a facility, or a user-defined set of devices.
   d. The ISMS shall provide a series of default icons and user definable custom icons in JPG, GIF, animated GIF, and PNG file formats. Variable sizes shall be supported in 16x16, 24x24, and 32x32 pixels.
   e. The ISMS shall support two icon techniques for alarm visualization: an overlay technique showing the state of the highest priority alarm on a device, and a decoration technique for displaying multiple alarms simultaneously for a device.
   f. The ISMS shall support creation and importing of images in JPG, GIF, or PNG file formats imported as a single layer base map.
   g. The ISMS shall support importing of multi-layer AutoCAD DXF R12 files, allow selected layers to be imported, and shall maintain layer separation within the system. The ISMS shall permit the re-import of a DXF file or individual layers from the file, without disturbing the other layers and icons previously placed on the map.
   h. The ISMS shall provide the ability to define map layers that can be dynamically turned on or off while editing and viewing during monitoring operations.
   i. The ISMS shall list maps alphabetically by facility in a navigation pane for easy access and additionally provide hyperlink icons that allow an operator to navigate and traverse through a series of maps quickly.
   j. The ISMS shall allow a default map defined per operator, such that the map automatically displays when the alarm graphics monitor window is launched. The user shall be able to size the alarm graphics monitor window as desired, maps, graphics symbols and icons shall maintain aspect ratios.

k. The user shall be able to zoom in to the map using a mouse wheel or right mouse click on a background point on the map.
l. The user shall be able to determine the state of each device by the icon's appearance, which shall change dynamically as alarms are set, reset, and cleared.
m. The user shall have right mouse button click access to the Alarm and Response Monitor from any symbol icon in an alarm state.
n. The user shall be able to initiate device control commands from a map using right mouse button click access of selected symbol icons. The control commands shall be device-type dependent and include the following:

1) Area/Zone – arm and disarm.
2) Cameras – launch live video.
3) Inputs – monitor on and off.
4) Outputs – activate on and off.
5) Reader/Doors – lock and unlock.

N. Database Reporting: The ISMS shall provide on-line database reporting without degrading system performance. The following reporting functions and capabilities shall be supported:

1. Predefined reports with the ability to create and save user definable templates for grouping, sorting, and filtering data. A minimum number of predefined reports shall be furnished covering the following topics:

a. Cardholder and card ID information.
b. System administration and device configurations.
c. System schedules and events.
d. Reader access.
e. Floor access.
f. Roll call / Muster.
g. Time and attendance.
h. Alarm history.
i. Badge history.
j. Operator history.

2. Reports shall allow operators to perform page setup, preview report on-line, print, and export reports to multiple file formats and destinations.

a. Export file formats supported shall include:

1) Crystal Reports.
2) Data Interchange Format.
3) Excel.
4) HTML.
5) Lotus.
6) ODBC.
7) Paginated Text.
8) Report Definition.
9) Rich Text Format.
10) Tab Delimited Text.
11) Unformatted Text.
12) Word.

b. Export destinations supported shall include:

1) Disk File.
2) Exchange Folder.
3) Lotus Domino Database.
4) Microsoft Mail (MAPI).

3. The ISMS shall support direct database connectivity for facilitating report generation from external 3rd party database applications. The following applications shall be supported:

a. Microsoft SQL Server.
b. Microsoft Access.
c. Crystal Reports Enterprise.

O. Integrated Video Surveillance: The ISMS shall support software level integration with video surveillance systems for facilitating real-time response to monitored events processed by the ISMS.

1. CCTV Matrix Switchers: The ISMS shall provide a CCTV matrix switcher interface that supports the following functionality:

a. Serial interface support via industry standard RS232 communications protocol.
b. Interface with multiple CCTV matrix switchers locally and remotely, via ISMS host server(s) and/or network connected client workstation(s).
c. The ability to define and assign CCTV “Enable”, “Disable”, and “Camera Alarm” messages to ISMS alarms.
d. The ISMS shall process alarms and transmit applicable “Enable”, “Disable”, and “Camera Alarm” messages to the CCTV matrix switcher in real-time.
e. The ISMS shall support a supervised bi-directional communications interface for receiving “video loss alarms” and detecting communication failure, should the specific CCTV matrix switcher interface provide that support.
f. The ISMS shall support the following CCTV matrix switcher interfaces:

1) American Dynamics 168 and 2150.
2) PHILIPS/Burle Allegiant TC8500 to TC8901series.
3) Kalatel KTD 312 and 348.
4) Pelco 9760
5) Generic User-definable

2. Digital Video Recorders: The ISMS shall provide a fully integrated digital video recorder, Network Video recorders and camera management interface for command and control video surveillance that supports the following functionality:

a. The ISMS shall support network connectivity to multiple digital video recorders (DVR) via ISMS host server(s) and network connected client workstation(s).
b. The communications interface between the ISMS and all DVR units shall be via 100/1000Mb Ethernet connectivity using industry standard TCP/IP protocol.
c. The ISMS shall provide a multi-window video management console for real time video device monitoring and control from any ISMS operator workstation. DVRs, cameras and assigned presets shall be displayed alphabetically and grouped by facility in a navigation pane for easy operator access.

d. The video management console shall permit operators to select or drag and drop cameras to create and save custom views using cameo formats for 1-UP, 2-UP, 4-UP, 9-UP, 16-UP, Custom 7-UP, Custom 11-UP, and Custom Center/Perimeter.

e. ISMS operators shall be able to simultaneously view and control multiple live video cameras across multiple DVR units. Camera control shall be mouse driven on-screen and shall support pan, tilt, zoom, iris, focus, and camera preset call-up functions.

f. ISMS operators shall be able to perform quick recall video playback on any selected camera view to request last 15sec, 30sec, 1min, 2min, 5min or selection from last 4 events listed for the selected camera.

g. ISMS operators shall be able to access and playback recorded video events with on-screen controls that support play forward, play reverse, fast forward, fast reverse, single frame advance, single frame reverse, pause, stop, and variable speed control functions.

h. ISMS operators shall be able to playback tagged video events stored locally on DVR units, based on date, time, alarm, event, text, and motion search queries from the ISMS history/archive database.

i. ISMS operators shall be able to save still image snapshots to file in the jpg file format from any live or recorded playback video stream.

j. ISMS operators shall be able to save video clips to file in native or AVI file formats from any live or recorded playback video stream.

k. ISMS operators shall be able to create and burn evidence CDs of selected video clips with required video player.

l. The ISMS shall support request for live and recorded video transmission from DVR units at various resolutions and display sizes, independent of actual DVR resolution setting for local recorded video. Such a feature shall be user configurable from the ISMS to facilitate network adaptability.

m. The ISMS systems shall allow the assignment of CCTV cameras and presets to ISMS alarm and card access events; for automating real-time camera control, automatic live video pop-up on alarm, video event tagging and providing quick access to live and recorded video from any ISMS operator workstation.

n. The ISMS shall provide simultaneous support for multi-vendor video drivers.

o. The ISMS shall monitor status of all DVR units for processing and reporting the following conditions:

    1) Online / Offline.
    2) Record status.
    3) Disk capacity status.
    4) Camera video loss.
    5) Camera alarm.

p. The ISMS shall be capable of supporting the following DVRs:

    1) GE Security DVMRe CD models.
    2) GE Security DVMRe CT and CT-II models.
    3) GE Security StoreSafe Pro and Pro-II models.
    4) GE Security SymDec, SymSafe and SymSafe Pro models.
    5) GE Security VisioWave and NVR 20, 40 or 60 model
    6) American Dynamics Intellex DVMS8000.
    7) Digital Watchdog DWPro.
    8) Integral Technologies DVXi, DSXpress.
    9) NiceVision Harmony & Pro.

10) Panasonic HD500.
11) Pelco DX8000.
12) Avigilon VMS – Alarm Tagging

P. Application Program Interface: The ISMS shall support an application program interface (API), which allows authorized software connections between the ISMS and external systems for developing custom interfaces and providing tightly coupled integrated solutions. The API for the ISMS shall facilitate real-time response to monitored events processed by the ISMS as well as control of devices managed by the ISMS.

1. The ISMS shall only allow authorized connections through the API.
2. The ISMS shall allow up to twenty-five (25) concurrent connections to external systems through the API.
3. The API shall expose the following aspects of the ISMS:

   a. Bi-directional alarm event processing for monitoring and acknowledgement
   b. Receiving ISMS card access activity events
   c. Receiving digital input events
   d. Receiving intrusion zone events
   e. Control of operator logins
   f. Control of alarm point monitoring On/Off
   g. Control of digital input points Enable/Disable
   h. Control of digital output points Open/Close
   i. Control of intrusion zones Arm/Disarm
   j. Control of control panel Modes

4. The API shall be fully documented and made available with sample application code.

2.3 SOFTWARE

A. Application & Database Server Software:

1. Operating System: Microsoft Windows [Windows 7 Pro or Server 2012]
2. Database: Microsoft SQL Server [MSDE or Server 2012]

B. Client Workstation Software:

1. Operating System: Microsoft Windows [Windows 7 Pro or Server 2012].

C. Integrated Security Management System Software:

1. Security Contractor shall provide GE Security, Facility Commander Wnx 7.7 or latest

   a. License for additional client workstations. (As per drawings)
   b. License for all access control readers. (As per drawings)
   c. License for digital video surveillance cameras integration. (As per drawings)

2. Facility Commander Wnx 7x Photo ID Card Production Option. (As per drawings)
3. Facility Commander Wnx 7.x Application Program Interface Option.

4. Security Contractor shall provide Facility Commander Wnx 7.x Integrated Digital Video 3rd Party Driver Option, individually licensed separately per application/database server. (provide for Avigilon per NVR)
5. Facility Commander Wnx 7.x Client Redundancy Device Fail-Over Option, licensed separately per application/database server.
6. Facility Commander Wnx 7.x Guard Tour Option, licensed separately per application/database server.
7. Facility Commander Wnx 7.x Terminal Services Option, licensed separately per application/database server.
8. Security Contractor shall provide Facility Commander Wnx 7.x OH Central Station Receiver Emulator Option for GE NX590E intrusion alarm monitoring direct over IP, licensed separately per application/database server.

2.4 HARDWARE

A. Host Server and Operator Workstations: Provided by ISMS supplier, factory-configured with all software pre-loaded and tested.

B. Computer requirements may vary based on system size and customer specific application requirements. Increasing memory capacity, hard drive capacity, processor speed, as well as specifying single dual core or dual processors, and multi-monitor displays shall be considered and recommended when required above minimum specifications.

1. Host Server Minimum Requirements:

   a. Dell PowerEdge R710 Rack server
   b. Xeon Quad Core E5504/2.0Ghz
   c. 4Gb Ram
   d. 4X73Gb Raid10 SAS Hot Plug Hard drive
   e. Redundant power supply
   f. DVD+/-RW
   g. Dual Port Gigabit NIC
   h. Internal/Ext Scsi Tape Drive Ready
   i. 3Yr Onsite next business day Warranty

      1) Windows 2012 / SQL 2012 Server software preload and application configuration service per server
      2) Microsoft SQL Server 2012 Standard Edition SFTW, Includes 10 Client Access Licenses (5 Device CAL)
      3) Windows 2012 Server software

2. Operator Workstation Minimum Requirements:

   a. Dell Optiplex 990MT Minitower Workstation
   b. Intel core I5 2400 Processor (3.1Ghz,6M)
   c. 4GB RAM, 2 X 250GB SATA HD Raid 1
   d. Dual 512MB AMD Radeon HD 6350 (2 DVI)
   e. 16X DVD+/-RW, Gigabit NIC
   f. Windows 7 Pro 32 Bit or 64 Bit
   g. Dual 24 Inch HD monitor DVI or HDMI
   h. USB Mouse and keyboard
   i. 3-Year On-Site Next Business Day Warranty

C. Control Panels: GE Security M2000 and M3000 PXNplus series as appropriate. The control panels shall be intelligent and fully stand-alone processor capable, making all local access control and alarm monitoring decisions without host server dependency. Control panels shall support and provide the following:

1. UL listed under UL 294 and UL 1076; FCC Part 15 and CE compliant.
2. Direct on-board support for industry standard RS232, RS422, Dial-up modem AT command set, and 10/100Mb Ethernet communications interfaces to ISMS host.
3. The 10/100Mb Ethernet NIC shall be onboard and support IT standard methods of communications with ISMS host including configuration support for static IP addressing, dynamic DNS, DHCP and DES encryption. PCMCIA Adapters or external terminal server devices will not be acceptable.
4. Support redundant communications to ISMS host; primary communications via 10/100Mb Ethernet with automatic switchover to secondary communications via dial-up modem when detecting network failure.
5. RS232 and RS422 communications ports for cascading/clustering multiple control panels via a single communications port interface to ISMS host.
6. Flashable memory support for facilitating remote firmware updates from ISMS host server and operator workstations; control panels shall remain on-line and operational during firmware update process.
7. The control panel shall be able to be configured & diagnosed remotely through a standard browser interface, independently of the ISMS host application.
8. The control panel shall support local database retention in the event of power failure, without the use of batteries that have to be replaced. Minimum retention without primary power source shall be 20 days. When primary power is restored, the control panel shall automatically attempt to establish communications with the ISMS host, in the event communications to ISMS host is not available, the control panel shall automatically return to operation with its last local database configuration.
9. Control panel cabinets shall be an industrial grade enclosure with knockouts outs for field wiring and have a key-locked and tamper protected door.
10. Low voltage power supply with uninterruptible battery backup allowing continued operations for a minimum of 4 hours at full load

D. Control Panel Interface Boards: The ISMS control panels shall support on board and/or expansion interface boards for access control readers, alarm monitoring, and input/output control. Control panels shall support and provide the following as required:

1. Access Control Reader Interfaces:

   a. Shall support hard-wired connections to readers, including power and communications. Connections shall be supported at a minimum distance of 2,000ft. (610m) Utilizing 22AWG 2-pair shielded and unshielded cabling.
   b. Shall support supervision, monitoring, and processing of the following:

      1) Reader tamper and communications.
      2) Status changes from locally wired door sensor and request to exit device.

   c. Shall support card only and card-plus-keypad style readers of the following technologies:

      1) Proximity.
      2) Smart Card.

3) Magnetic Stripe.
4) Wiegand.
5) Barcode.
6) BaFe Touch.
7) Biometrics.

2. Input / Output Point Interfaces:

a. Shall support 4-State supervised alarm inputs.
b. Shall support relay and TTL level output points.

E. Power Over Ethernet Switch:

1. GE-DSSG-244-POE Power over Ethernet Managed Switch or equal

F. IP Network Edge Door Control Panel: GE Security DirecDoor. The control panels shall be intelligent and fully stand-alone processor capable, making all local access control and alarm monitoring decisions without host server dependency. Control panels shall support and provide the following:

1. UL listed under UL 294 and UL 1076; FCC Part 15 and CE compliant.
2. Direct on-board support 10/100Mb Ethernet communications interfaces to ISMS host.
3. The 10/100Mb Ethernet NIC shall be onboard and support IT standard methods of communications with ISMS host including configuration support for static IP addressing, dynamic DNS, DHCP and DES encryption. PCMCIA Adapters or external terminal server devices will not be acceptable.
4. Support redundant communications to ISMS host; primary communications via 10/100Mb Ethernet with automatic switchover to secondary communications via dial-up modem when detecting network failure.
5. Flashable memory support for facilitating remote firmware updates from ISMS host server and operator workstations; control panels shall remain on-line and operational during firmware update process.
6. The control panel shall be able to be configured & diagnosed remotely through a standard browser interface, independently of the ISMS host application.
7. The control panel shall support local database retention in the event of power failure, without the use of batteries that have to be replaced. Minimum retention without primary power source shall be 20 days. When primary power is restored, the control panel shall automatically attempt to establish communications with the ISMS host, in the event communications to ISMS host is not available, the control panel shall automatically return to operation with its last local database configuration.
8. Control panel cabinets shall be an industrial grade enclosure with knockouts outs for field wiring and have a key-locked and tamper protected door.
9. IEEE 802.3af PoE or Auxiliary Uninterruptible Power Supply: Battery rated for a minimum 4 hours of continuous operation at full load.

G. Access Control Card Readers:

1. Reader Technology: As specified by selected card technology and application requirements; compatible with ISMS control panels and commercially available from industry leading manufactures that include but not limited to:

a. Allegion Multitech series
b. Other approved equals.

2. The specified card and reader manufacturer shall support a full product line that offers multiple models and/or styles to fit various installation and application requirements including:

    a. Multi-technology readers that will read Proximity, Vicinity, and Mifare Smart Card credentials simultaneously.
    b. Card only and card-plus-keypad style readers.
    c. Rugged, weatherized enclosures rated for indoor and outdoor mounting.
    d. Rated for mounting on metal and non-metal surfaces.
    e. Provide audible and visual indicators for reader status and validation of granted and denied access.

3. Provide quantities for each model and/or style indicated on drawings.

H. Cards: As specified by OWNER preference and application requirements; shall be CR-80 standard credit card size; top quality, durable and resilient PVC or PVC/polyester composite material.

1. Card Technology:

    a. Proximity: GE ProxLite card Model 7000055001 or equal

2. Card Options:

    a. Single sided gloss white photo finish for direct printing.
    b. Double sided gloss white photo finish for direct printing.
    c. Stamped or marked with external ID reference number.
    d. Capable of being slot-punched at edge and equipped with strap clip for attachment to cardholder's clothing.

3. Provide initial quantity of 200 cards – Coordinate with Owner on card # sequence.
4. Provide USB Keyboard Wedge reader for entering new users

I. Electric Door Hardware:

1. Electronic locking devices shall have a separate power supply to support the locks specified below. The unit shall incorporate integral battery charging capabilities and a fused line voltage input for a minimum of eight (8) individual locks. All power supplies shall be equipped with optional battery pack for up to 48 hours. The unit shall be equipped with a module to accommodate fire alarm NC contacts when a fire alarm activates.
2. All locks shall be fail-secure unless otherwise specified. Locks specified, as being fail-safe shall be installed in accordance to Section 5-2.1.6.2 of NFPA Life Safety Code 101.
3. The CONTRACTOR shall coordinate with the Fire Alarm and Sprinkler Contractors for the interconnection of the specified ISMS.
4. Specified Products: Door hardware provided by Section 087100.

    a. Electric Strike: see door hardware specification in section 087100
    b. Crash Bar: see door hardware specification in section 087100
    c. Electric Mortise Lock: see door hardware specification in section 08710
    d. Provide quantities for each model indicated on drawings.

J. Door Hardware Configuration:

1. Card access controlled doors shall be equipped with a passive infrared request-to-exit device specifically designed for electromechanical lock release. Device shall be equipped with a DPST (NO & NC) 1-amp contact.

K. Intrusion Detection Devices:

1. Door Sensor Contacts:

a. Recessed magnetic door contacts with dual output shall be provided for all card access doors and doors requiring intrusion detection. Door contacts shall be provided on single doors and both leaves of double doors at locations indicated on drawings. Color to match existing finish.
b. Where building structure makes it impossible to install conduit within the wall or doorframe, the SECURITY CONTRACTOR shall substitute surface-mount contacts with armored cable for the specified contacts.
c. Heavy-duty door contacts with armored cable shall be provided for all roll-up doors where indicated on the drawing.
d. All devices shall be wired point to point and to the nearest ISMS control panel interface.

2. Motion Detectors:

a. WALL MOUNTED or CEILING MOUNTED passive infrared (PIR) motion detectors shall be provided where indicated on drawings. Motion detectors shall be masked or oriented to minimize the likelihood of nuisance alarms caused by environmental conditions.
b. All devices shall be wired point to point and to the nearest ISMS control panel interface.
c. A 12VDC centralized power supply shall be utilized to power motion detectors.

3. Specified Products:

a. Provide quantities for each type and model indicated on drawings.
b. Request to exit: [Interlogix] RCR-REX-W or equal [counts per drawing]
c. Door sensor contacts:[Interlogix], [1074D-N] or equal [counts per drawing]
d. Motion Detectors: [Interlogix], [AP750-ID] or equal. [counts per drawing]
e. Glass Break Sensors:[Interlogix], [5845-ID] or equal [counts per drawing]
f. Key Pad [Interlogix] NX-748E or equal [counts per drawing]
g. Intrusion Panel [Interlogix], NX-8E or equal – Size IO as per drawings

2.5 SUMMARY - INTEGRATED IP BASED CCTV

A. The Contractor shall include all necessary wiring, cabling, labor, tools, equipment, and ancillary materials required to provide a complete and operational Video Management System.

B. Requirements are indicated elsewhere in these specifications for work including, but not limited to:

1. Conduit, 110 VAC power extensions, and other electrical work.
2. Provide cameras, POE switches, NVMS server and workstations as per drawings.

3. The Security Contractor shall attach to dedicated security local area network for the connections as shown on the attached drawings. Contractor switch and server are to be located in contractor provided rack. *See rack specification.*

C. NVMS shall integrate with the Facility Commander Wnx card access system via software.

D. The extent of VMS work is defined to include but not limited to the following:

1. Security Contractor shall provide Hardware and software as per drawings connected to the OWNER LAN, WAN or VLAN.
2. Security Contractor shall provide Avigilon vandal resistant cameras outdoors as specified in the drawings.

E. Installing the Video Management System and bringing it to operational status for acceptance shall include but not limited to the following:

1. Determine hardware, software, and operations requirements for implementation.
2. Install hardware and software.
3. Setup and configure communications between the host server, operator workstations, and cameras. Provide workstation as per drawings.
4. Setup and configure VMS application and database.
5. Test VMS operations based on a point-by-point walkthrough inspection.
6. Perform end-user training. Demonstrate how to:

a. Add users and access rights
b. View video
c. Export video
d. Build views
e. Search video

2.6 INTEGRATED IP BASED CCTV

A. All systems and components shall have undergone a thoroughly documented quality assurance process by the manufacturer. The manufacturer's warranty, extended warranty and replacement policies shall be included for each specified component.

B. The Network Video Management Software, NVR Hardware and related components shall be installed and commissioned by authorized integrators trained and certified by the manufacturer. Certification and training for authorized integrators shall be available from the manufacturer.

C. The manufacturer shall have a dedicated professional services group providing Integrators and End Users the following fee-based services including but not limited to: training, installation, commissioning, remote diagnostics and integration with 3rd party software and hardware systems.

2.7 DESCRIPTION

A. The Network Video Management Software (NVMS)

1. The Network Video Management Software (NVMS) shall be Avigilon Control Center (ACC) version 5x or later. The NVMS shall be installed on the access control work station and integrated with Facility Commander Wnx software as per drawings.
2. The Network Video Management Software (NVMS) shall be an enterprise level software solution that shall be scalable from one client, server, and camera to hundreds of clients, servers, and cameras.
3. The Network Video Management Software (NVMS) shall consist of server software applications and client software applications.
4. The Network Video Management Software (NVMS)shall be available in the following languages:

    a. English
    b. Finnish
    c. French
    d. German
    e. Italian
    f. Portuguese
    g. Spanish
    h. Swedish

5. The Network Video Management Software (NVMS) shall include the following applications:

    a. Server Software Applications

        1) Control Center Server
        2) Control Center Admin Tool

    b. Client Software Applications

        1) Control Center Client
        2) Control Center Web Client
        3) Control Center Player
        4) Control Center Camera Installation Tool

6. The Network Video Management Software (NVMS) shall permit server and client software applications to be installed and run on both the same computer or on separate computers.
7. The Network Video Management Software (NVMS) shall support edge based storage and processing of video and audio inputs.
8. The Network Video Management Software (NVMS) shall support High Definition Stream Management (HDSM) architecture which includes:

    a. Support for industry standard JPEG2000, MJPEG, MPEG-4, and H.264 compression formats
    b. Support for reducing the required client bandwidth and processing power by only transmitting what is necessary to view the video stream at full quality (e.g. if a user is viewing a 16MP camera in a 1MP window then a 1MP representation of the 16MP image shall be transmitted).

9. The Network Video Management Software (NVMS) shall support recording and management of video and audio sources including:

    a. Avigilon HD IP Cameras (1 – 5 Megapixel)

b. Avigilon HD IP Dome Cameras (1 – 5 Megapixels)
c. Avigilon Panoramic HD IP Dome Cameras (8 Megapixels)
d. Avigilon HD H.264 Day/Night IP Cameras (1– 2 Megapixel)
e. Avigilon HD H.264 Day/Night IP Dome Cameras (1– 2 Megapixel)
f. Avigilon HD PRO IP Cameras (2 – 16 Megapixel)
g. Composite video from analog cameras, PTZ domes and thermal imagers via Avigilon ENC-4PORT analog encoder
h. Third-Party IP Devices

1) ACTi Cameras/Encoders
2) Arecont Cameras
3) Axis Cameras/Encoders
4) Mobotix Cameras
5) ONVIF Cameras
6) Panasonic Cameras
7) Pelco Cameras
8) Samsung Cameras
9) Sanyo Cameras
10) Sightlogix Cameras
11) Sony Cameras
12) VideoIQ Cameras

10. The Network Video Management Software (NVMS) shall support recording and monitoring video and audio streams from sources with bandwidth up to 90 Mbit/sec, frame rate up to 60 fps, and video resolution up to 16MP (4872x3248).
11. The Network Video Management Software (NVMS) shall support the decompression of H.264 video through the client graphics card instead of using the client processing power.
12. The Network Video Management Software (NVMS) shall require no proprietary recording hardware, no hardware multiplexer or time-division technology for video and audio recording or monitoring.
13. The Network Video Management Software (NVMS) shall not limit the storage capacity and shall allow for upgrades of recording capacity.
14. The Network Video Management Software (NVMS) shall digitally sign recorded video and audio using 256-bit encryption so video can be authenticated for evidentiary purposes.
15. The Network Video Management Software (NVMS) shall securely transmit all command and control data via TCP/IP using cryptographic keys based on SSL to prevent eavesdropping or tampering.
16. The Network Video Management Software (NVMS) shall be installed on systems which meet or exceed the manufacturer's requirements found in this link: http://avigilon.com/support/req/
17. The Network Video Management Software (NVMS) shall also be available in turnkey NVR platforms utilizing enterprise-grade servers and workstations pre-loaded with NVMS software and tested to manufacturer specifications for deployment in enterprise applications.
18. The Network Video Management Software (NVMS) shall be available in either a licensed Enterprise or Standard edition.
19. The Network Video Management Software (NVMS) shall support integration with the GE Security Facility Commander Wnx v7.x platform for Electronic Access Control and Alarm Monitoring (Access System).

a. Network Video Management Software (NVMS) will provide the mechanism by which individual alarm(s) from the Access system can be pre-selected

and configured to be monitored and, in turn, trigger event driven video operations

b. The Network Video Management Software shall support software level integration (via the Wnx API) with GE Facility Commander for facilitating real-time response to monitored events processed by Wnx v7.x. Alarm events. The API integration should include:

    1) Bi-directional alarm event processing for monitoring and acknowledgement
    2) Receiving card access activity events
    3) Receiving digital input events
    4) Receiving intrusion zone events

c. Occurrences for "Alarm" and "Reset" conditions for each of the pre-selected Access system alarms will be processed and managed from the NVMS system's Live View workspace that is reserved for displaying alarm notifications in the alarm list message pane or from the FCWnx alarm viewer. If the Alarm pane is hidden, the alarm can be acknowledged from the Camera display tile.

d. Once an Access system initiated alarm occurrence is acknowledged from the NVMS system, it should be automatically acknowledged and processed in the Access System alarm monitor queue without further operator intervention.

20. The Network Video Management Software (NVMS) shall support integration with Lenel OnGuard and Lenel Facility Commander Wnx.
21. The Network Video Management Software (NVMS) shall support integration with Cardax FT Command Center.
22. The Network Video Management Software (NVMS) shall support integration with RS2.
23. The Network Video Management Software (NVMS) shall support integration with DSX.
24. The Network Video Management Software (NVMS) shall support integration with Jacques VoIP Voice Communication System.
25. The Network Video Management Software (NVMS) shall support integration with Stentofon AlphaCom XE.
26. The Network Video Management Software (NVMS) shall support integration with DDS Amadeus.
27. The Network Video Management Software (NVMS) shall be capable of being upgraded from one version to another without having to uninstall the previous version.
28. The Network Video Management Software (NVMS) shall be capable of being upgraded from Standard edition to Enterprise edition without having to uninstall the application.
29. The Network Video Management Software (NVMS) shall automatically detect if video or audio source firmware is out of date with respect to the current installed software and upgrade it.
30. The Network Video Management Software (NVMS) shall automatically detect if client application software is out of date with respect to the current installed server software and upgrade it.
31. The Network Video Management Software (NVMS) shall run as a service configured to automatically start when the server or workstation is powered on and automatically recover from failure or attempted tampering.

32. The Network Video Management Software (NVMS) shall allow system administration, and live and recorded video and audio monitoring all from a single client application that can be located anywhere on the network.
33. The Network Video Management Software (NVMS) shall automatically discover all Control Center Server instances running on computers connected to the same network as the Control Center Client.
34. The Network Video Management Software (NVMS) shall provide a search functionality to discover Control Center Server instances running on computers connected on a different network segment than the Control Center Client by using IP addresses or hostnames.
35. The Network Video Management Software (NVMS) shall automatically discover video and audio sources that are connected to the same network as the Control Center Server.
36. The Network Video Management Software (NVMS) shall provide a search functionality to discover video and audio sources that are connected on a different network segment than the Control Center Server.
37. The Network Video Management Software (NVMS) shall provide the ability to connect a video or audio source to multiple NVRs to achieve redundant recording.
38. The Network Video Management Software (NVMS) shall provide the ability to create a failover connection for a video or audio source. If the NVR that the video or audio source is connected to goes offline then the failover NVR will take over the connection.
39. The Network Video Management Software (NVMS) shall provide administration of all system connections from a single window.
40. The Network Video Management Software (NVMS) shall support receiving Simple Network Management Protocol (SNMP) messages from servers and alert the user.
41. The Network Video Management Software (NVMS) shall detect if the video or audio signal is lost and alert the system administrator.
42. The Network Video Management Software (NVMS) shall provide the capability to rename all video and audio sources and NVRs.
43. The Network Video Management Software (NVMS) shall record video and audio streams based on a recording schedule that can be defined individually for each video source. The schedule shall be created with the following parameters:

    a. Recording Mode

        1) Continuous
        2) Motion
        3) Digital Inputs
        4) Alarms
        5) POS Transactions
        6) License Plates

    b. Time and Date Settings

        1) Daily
        2) Weekly

44. The Network Video Management Software (NVMS) shall provide the ability to manually trigger recording.
45. The Network Video Management Software (NVMS) shall provide a pre-event and post-event recording option.
46. The Network Video Management Software (NVMS) shall provide a reference frame recording option in the absence of events.

47. The Network Video Management Software (NVMS) shall perform motion detection on each individual video source with adjustable sensitivity, threshold and detection zones.
48. The Network Video Management Software (NVMS) shall provide the ability to reduce the image rate of recorded video over time as a means of increasing record time. The image rate shall be able to be reduced to one half or one quarter of the original image rate. This setting can be configured separately for each video source.
49. The Network Video Management Software (NVMS) shall provide the ability to set a maximum recorded video retention time for each video source.
50. The Network Video Management Software (NVMS) shall perform dynamic bandwidth management to ensure that the total bandwidth does not overload the system.
51. The Network Video Management Software (NVMS) shall authenticate users before granting access to the system. Access rights for each user shall be able to be defined individually for each user, and shall and include:

    a. Viewing live images

        1) Using PTZ controls
        2) Locking PTZ controls
        3) Trigger manual recording

    b. Viewing recorded images

        1) Exporting images
        2) Backup recorded images

    c. Connect and disconnect cameras
    d. Setup cameras

        1) Setup general settings
        2) Setup network settings
        3) Setup image and display settings
        4) Setup compression and image rate
        5) Setup image dimension settings
        6) Setup motion detection settings
        7) Setup privacy zone settings
        8) Setup manual recording settings
        9) Setup digital input & output settings
        10) Setup microphone settings

    e. Setup servers

        1) Setup general settings
        2) Setup schedule settings
        3) Setup recording and bandwidth settings
        4) Setup user and group settings
        5) Setup alarm management settings
        6) Setup scheduled backup settings
        7) Setup POS transaction settings
        8) Setup email settings
        9) Setup rule engine settings
        10) View system log

f. Access to individual video and audio sources

52. The Network Video Management Software (NVMS) shall provide the ability to import Windows users and use Windows credentials to authenticate users.
53. The Network Video Management Software (NVMS) shall provide the ability to create alarms.
54. The Network Video Management Software (NVMS) shall provide the ability to schedule backups of recorded video with associated events to a local folder or mapped network drive.
55. The Network Video Management Software (NVMS) shall provide the ability to email users and system administrators when an event or system health error occurs.
56. The Network Video Management Software (NVMS) shall maintain an event log for the following events:

a. User Events

1) User(s) login
2) User(s) logout
3) Server setting changed
4) Device setting changed
5) Device connection
6) Device disconnected
7) Digital output triggered
8) Bookmark added
9) Bookmark updated
10) Bookmark deleted
11) PTZ moved
12) PTZ idle
13) Export performed

b. Device Events

1) Connection created
2) Connection removed
3) Connection created to standby server
4) Connection removed from standby server
5) Connection failure
6) Connection restored
7) Network packet loss unacceptable
8) Network packet loss acceptable
9) Motion started
10) Motion ended
11) Recording started
12) Recording ended
13) Recording interrupted
14) Recording resumed
15) Digital input activated
16) Digital input deactivated
17) Firmware upgrade started
18) Firmware upgrade completed
19) Firmware upgrade failed
20) License plate watchlist match

c. Server Events

1) Control Center license expired
2) Control Center license expires soon
3) Control Center Server started
4) Control Center Server shutting down
5) Control Center Server terminated unexpectedly
6) Database error
7) Data initialization error
8) Data volume failed
9) Data volume recovered
10) Data volume size reduced
11) Data write error
12) Data upgrade started
13) Data upgrade completed
14) Data upgrade failed
15) Data recovery started
16) Data recovery completed
17) Data recovery failed
18) Network connection found
19) Network connection lost
20) Network error
21) Network error resolved
22) Email send error
23) Server hardware error
24) Backup started
25) Backup completed
26) Backup failed

57. The Network Video Management Software (NVMS) shall have the capability to execute any of the following actions in response to any of the events listed above:

a. User Notification Actions

1) Display on-screen message
2) Send an email
3) Play a sound

b. Monitoring Actions

1) Start live streaming video

c. Device Actions

1) Reboot camera
2) Trigger digital output

d. PTZ Actions

1) Go to preset
2) Run a pattern
3) Set auxiliary
4) Clear auxiliary

e. Alarm actions

1) Trigger an alarm
2) Acknowledge an alarm

58. The Network Video Management Software (NVMS) shall provide a maintenance log and audit trail of all system errors and events.
59. The Network Video Management Software (NVMS) shall provide the ability receive transaction information from point-of-sale sources.
60. The Network Video Management Software (NVMS) shall provide the ability to generate events based on point-of-sale transaction exceptions.
61. The Network Video Management Software (NVMS) shall provide the ability to define a region of an image where license plate detection is performed. Detected license plates shall be stored along with the video data.
62. The Network Video Management Software (NVMS) shall provide the ability to create a watchlist that will be used to create events when any license plate on the watchlist is detected in the images being analyzed.
63. The Network Video Management Software (NVMS) shall provide the ability to enable and configure PTZ control on the RS-485 interface of a video source.
64. The Network Video Management Software (NVMS) shall support the following list of PTZ camera protocols:

    a. American Dynamics Sensormatic
    b. AXSYS
    c. Ernitec
    d. Honeywell Diamond
    e. Kalatel ASCII
    f. Pelco D
    g. Pelco P
    h. Videotec

65. The Network Video Management Software (NVMS) shall provide the ability to change the network settings for a video and audio source.
66. The Network Video Management Software (NVMS) shall provide the ability to change image quality and image rate parameters for a video source without affecting the settings on the other video sources.
67. The Network Video Management Software (NVMS) shall provide the ability to enable a secondary stream for live viewing.
68. The Network Video Management Software (NVMS) shall provide the ability to change the exposure, iris, IR filter, backlight compensation, gain, priority, sharpening, saturation, focus, and white balance settings for a video source.
69. The Network Video Management Software (NVMS) shall provide the ability to change the image dimensions for a video source.
70. The Network Video Management Software (NVMS) shall provide the ability to add privacy zones to a video source to block unwanted areas in the image field of view.
71. The Network Video Management Software (NVMS) shall provide the ability to set a maximum recording duration for manually triggered recording for a video source.
72. The Network Video Management Software (NVMS) shall provide the ability to change the input and gain for an audio source.
73. The Network Video Management Software (NVMS) shall provide the ability to link any audio source to any video source.
74. The Network Video Management Software (NVMS) shall provide the ability to set a limit on the maximum bandwidth transmitted to the Control Center Client application from the Control Center Server application.
75. The Network Video Management Software (NVMS) shall provide the ability to automatically log in to an NVR.

76. The Network Video Management Software (NVMS) shall provide the ability to automatically log out of an NVR when the application is left idle.
77. The Network Video Management Software (NVMS) shall provide the ability to save and restore the window layout.
78. The Network Video Management Software (NVMS) shall provide the ability to control the system using a PC keyboard or joystick.
79. The Network Video Management Software (NVMS) shall provide the ability to import and export client settings such as maps, views, and web pages.
80. The Network Video Management Software (NVMS) shall support live or recorded video monitoring of 1 to 36 video streams simultaneously on a single monitor with the following possible layouts.

    a. Full Screen
    b. 2 x 2
    c. 3 x 3
    d. 4 x 4
    e. 5 x 5
    f. 6 x 6
    g. 1 + 5
    h. 1 + 7
    i. 1+ 12
    j. 2 + 8

81. The Network Video Management Software (NVMS) shall support the ability to bias the displayed video to a higher frame rate or to a lower image resolution if the client network bandwidth or client processing power is insufficient to display the full frame rate and image resolution.
82. The Network Video Management Software (NVMS) shall support the ability to display the following list of image overlays:

    a. Camera Name
    b. Camera Location
    c. Timestamp
    d. Record Indicator
    e. PTZ Controls
    f. Motion Activity
    g. License Plate

83. The Network Video Management Software (NVMS) shall support an unlimited number of monitors for monitoring video and audio streams.
84. The Network Video Management Software (NVMS) shall support monitoring live and recorded video and audio streams simultaneously on the same monitor.
85. The Network Video Management Software (NVMS) shall support viewing the same live or recorded video stream at different zoom levels.
86. The Network Video Management Software (NVMS) shall support the creation of unlimited views with unique layouts of video streams.
87. The Network Video Management Software (NVMS) shall support the ability to full-screen a view.
88. The Network Video Management Software (NVMS) shall support the ability to save views.
89. The Network Video Management Software (NVMS) shall support the ability to cycle through views (guard tour) based on a specified interval.
90. The Network Video Management Software (NVMS) shall display all video sources connected to the system.

91. The Network Video Management Software (NVMS) shall support the ability to drag and drop a video source from a tree of video sources into a window for live or recorded video and audio monitoring.
92. The Network Video Management Software (NVMS) shall support the ability to drag and drop a view from a tree of views into a window for live or recorded video and audio monitoring.
93. The Network Video Management Software (NVMS) shall support the ability to configure how the tree of video sources and views is displayed.
94. The Network Video Management Software (NVMS) shall support the ability to designate one or more regions in a window for displaying video directly linked to triggered alarms and rules.
95. The Network Video Management Software (NVMS) shall support the ability to acknowledge alarms from the designated video display area.
96. The Network Video Management Software (NVMS) shall support the ability to manually trigger digital output.
97. The Network Video Management Software (NVMS) shall support the ability to create a map that represents the physical location of cameras and other devices throughout the surveillance system. Maps shall be created from images stored in JPEG, BMP, PNG, or GIF image formats. Maps shall have the ability to contain links so as to create a hierarchy of interlinked maps.
98. The Network Video Management Software (NVMS) shall support the ability to create a map that has a link to a section of the entire image region.
99. The Network Video Management Software (NVMS) shall support the ability to drag and drop a video source from a map into a window for live or recorded video and audio monitoring.
100. The Network Video Management Software (NVMS) shall highlight a camera on a map when an alarm linked to the camera is triggered.
101. The Network Video Management Software (NVMS) shall support the ability to save a link to a web page and view the web page in a window.
102. The Network Video Management Software (NVMS) shall support digital zooming and panning on live and recorded video streams.
103. The Network Video Management Software (NVMS) shall support controlling mechanical pan-tilt-zoom, iris, and focus as well as setting presets and patterns.
104. The Network Video Management Software (NVMS) shall support controlling mechanical pan-tilt-zoom camera on-screen display and auxiliary controls.
105. The Network Video Management Software (NVMS) shall support locking PTZ controls.
106. The Network Video Management Software (NVMS) shall support control of a mechanical pan-tilt-zoom camera with a USB joystick.
107. The Network Video Management Software (NVMS) shall support forward and reverse playback of recorded video and audio at variable speeds.
108. The Network Video Management Software (NVMS) shall synchronously playback recorded video and audio from selected video sources.
109. The Network Video Management Software (NVMS) shall support navigation of recorded video and audio via calendar, timeline, or events.
110. The Network Video Management Software (NVMS) shall support a timeline that displays all connected video sources and the corresponding motion and recording events.
111. The Network Video Management Software (NVMS) shall support a timeline that can display the entire time range down to one second of recorded video and audio.
112. The Network Video Management Software (NVMS) shall support creating bookmarks for recorded video and audio, displaying the bookmarks on the timeline, and searching for bookmarks.
113. The Network Video Management Software (NVMS) shall support protecting a bookmark so the video and audio data is never overwritten.

114. The Network Video Management Software (NVMS) shall support monitoring alarms.
115. The Network Video Management Software (NVMS) shall support the ability to assign alarms to users.
116. The Network Video Management Software (NVMS) shall support the ability to acknowledge alarms.
117. The Network Video Management Software (NVMS) shall support searching through recorded video and audio based on various search criteria including time, date, video source, and events.
118. The Network Video Management Software (NVMS) shall support searching through recorded video based on motion in user defined areas (pixel search).
119. The Network Video Management Software (NVMS) shall support searching through recorded video based on time, date, video source, and image region and have the results displayed as series of thumbnail images.
120. The Network Video Management Software (NVMS) shall support searching through recorded video based on alarm events.
121. The Network Video Management Software (NVMS) shall support searching through recorded video based on point-of-sale transaction events.
122. The Network Video Management Software (NVMS) shall support searching through recorded video based on license plates detected in the images of the video source.
123. The Network Video Management Software (NVMS) shall support the ability to export recorded video in the following formats:

    a. Native
    b. JPEG
    c. PNG
    d. TIFF
    e. AVI
    f. WAV
    g. PDF
    h. Print

124. The Network Video Management Software (NVMS) shall support the ability to export recorded audio in WAV format.
125. The Network Video Management Software (NVMS) shall support the ability to snapshot a live or recorded image and export it from the system.
126. The Network Video Management Software (NVMS) shall support the ability to export a live stream of images in the following formats:

    a. JPEG
    b. PNG
    c. TIFF

127. The Network Video Management Software (NVMS) shall support the ability to export video from multiple camera streams in Native format.
128. The Network Video Management Software (NVMS) shall support reviewing video and audio that was exported in the Native format.
129. The Network Video Management Software (NVMS) shall support authenticating video that was exported in the Native format to validate that it was not tampered with.
130. The Network Video Management Software (NVMS) shall support converting video that was exported in the Native format to an industry standard format.
131. The Network Video Management Software (NVMS) shall support reviewing video and audio stored in a backup.

2.8 VIDEO CAMERA MOUNTS

A. Security contractor shall furnish and install all interior and exterior CCTV camera mounts and mounting hardware as needed. All mounts shall be bolted or clamped (not welded) in place to allow for relocation. Pendant mounts shall be suitable for use as wall, ceiling, column and parapet. Pendant mounts shall attach to the camera housing with section of standard 1.5-inch threaded pipe. Fixed camera mounts shall be universal wall-ceiling mounts with adjustable mount head. Installation and mounting shall be in strict accordance with requirements for applicable seismic classification. The Wall Mount may be mounted to a standard outlet box, which allows convenient, concealed cable routing to the mount. The body of the mount is hollow allowing wiring to be concealed as it is run from the wall to the camera. It is intended for indoor use.

2.9 INSTALLATION OF CCTV

A. Examine areas and conditions under which CCTV systems are to be installed, and notify Architect/Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Install CCTV systems including components where indicated, in accordance with equipment manufacturer's written instructions, in compliance with National Electrical Code, and with recognized industry practices, to ensure that CCTV system complies with requirements and serves intended purposes.

C. Use extreme care in handling, fishing and pulling-in electronic coaxial cable to avoid damage to cable and shielding. Avoid excessive and sharp bends.

D. Install CCTV equipment properly to avoid causing mechanical stresses, twisting or misalignment of equipment being exerted by clamps, supports, and cabling.

E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

F. Provide equipment-grounding connections for CCTV systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds. Provide grounding conductors for antennas and antenna supporting structures without splices or connections in the conductor.

G. Set field-adjustable CCTV system components for input voltages, current settings and frequency settings.

H. Touch-up scratched and marred surfaces to match original finishes; remove dirt and construction debris.

I. The Network Video Management Software, NVR Hardware and related components shall be installed and commissioned by authorized integrators certified by the manufacturer.

2.10 NETWORK VIDEO RECORDER

A. Motion Detection: provide motion detection to analyze the motion content of all camera inputs, ensuring that cameras with motion present become priority for recording.

B. Network Digital Video Server, 1200 MIPs, Windows server 2012, 84 TB of internal storage, Dual Gigabit Ethernet Connection, Raid 5 Storage, 2 GB memory minimum. The server shall have Hot-Swappable Hard Drives, redundant power supplies, Remote Configuration and Upgrade, Tamper-resistant Data Storage, Progressive lossless Recording. See storage requirements to determine if additional storage is needed.

C. Backup Power - Provide Rack mount - MIDATLPRO-UPS2200R8IP - 2150VA/1650W UPS web enabled 9' cord, NEMA 5-20P plug or equal

D. Licensing: 3 years for all system software, client software and camera licensing. Provide client licenses for workstations as per drawings.

2.11 Rack MIDDLE ATLANTIC MRK-4436-NVR CONFIGURED NVR RACK, 44UD, 36D model number 358796 or equal

A. Power provided by others – 20 amp 110 VAC required

B. Provide 19” Rack system including the following components. Provide sides.

1. 231128 - PD-915R - 115 Volt rack mount 9- outlet power strip
2. 231190 - EB4 econo-blank flanged 4 RMU black power coat finish 7.00"
3. 231183 - EB2 2RU black
4. 231178 - EB1 panels in ploy bags
5. 369897- RM-KB-LCD17X8KV -17" rack-mount LCD screen monitor, keyboard with mouse [or equal KVM switch].

2.12 WORK STATION MONITOR

A. Provide as per drawings. Avigilon 24” commercial grade CCTV monitor model (M2300) or equal

1. Monitor
2. 24",
3. LCD,
4. 2.3 Megapixel
5. 16:10 Widescreen Aspect Ratio

2.13 DEMOSTRATION

A. Train Owner's operating personnel in the operation of the system. Provide a minimum of 2 hours of training.

B. Schedule training with advance notice of at least 7 days

2.14 NETWORK BACKBONE (BETWEEN BUILDINGS)

A. Contractor shall provide a single mode fiber based network connection between buildings. Include patch panels at each demark location in the new building.

B. Network connection shall be 1 Gigabit from the security network switch to switch

2.15 CAMERAS

A. Indoor

1. Avigilon Model number 1.0C-H4A-D1 - 1.0 Megapixel (720p) WDR, LightCatcher, Day/Night, Indoor Dome, 3-9mm f/1.3P-iris lens, Self-Learning Video Analytics. Quantity as shown on plans.
2. Avigilon Model number 2.0C-H4A-DP1 - 2.0 Megapixel (1080p) WDR, LightCatcher, Day/Night, Pendant Dome, 3-9mm f/1.3P-iris lens, Self-Learning Video Analytics. Provide with wall mount - Avigilon H4A-MT-WALL1. Quantity as shown on plans.

B. Outdoor

1. Avigilon Model number 5.0L-4A-DP1-IR - 5.0 Megapixel, LightCatcher, Day/Night, Pendant Dome, 4.3-8mm f/1.8P – iris lens, Integrated IR, Self-Learning Video Analytics. Provide with wall mount – Avigilon H4A-MT-WALL1. Quantity as shown on plans

2.16 CCTV WORK STATION

A. Contractor shall furnish and install CCTV workstation(s) as per drawings

B. Avigilon Control Center Professional high performance remote monitoring workstation for up to two monitors. Minimum support of 120 MIPs.

C. Location(s) to be determined by Owner

2.17 CCTV VIDEO SWITCH

A. Contractor shall furnish and install UTC/Interlogix/GE Security (a Division of UTC Fire & Security) model #GE-DSSG-244-PoE Managed Switches or approved equal as needed to support all CCTV cameras shown on project drawing.

B. Installation Location – as per drawings

2.18 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components. DITEK MR-POE and DITEK-12POE or equal

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 26 Section “Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 26 Section "Surge Protection for Low-Voltage Electrical Power Circuits” as recommended by manufacturer for type of line being protected.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

PART 3 - EXECUTION

3.1 SECURITY CONTRACTOR

A. The CONTRACTOR shall be a local installation and service organization, currently recognized as a factory authorized representative by the manufacturer of the specified system.

B. At time of bid, the SECURITY CONTRACTOR shall be licensed by the state or local jurisdiction to perform security work within the state. Contractors who have security licenses or permits pending shall not be considered acceptable for bidding on this project.

C. The SECURITY CONTRACTOR shall assure that all personnel working on the project are registered with the state or local jurisdiction Systems Licensing Board as provided for by current state statutes.

D. At the time of bid, the SECURITY CONTRACTOR shall provide satisfactory evidence of liability insurance and Workmen's Compensation coverage for employed personnel as required by law.

3.2 PROJECT MANAGEMENT

A. The SECURITY CONTRACTOR shall provide an on-site, factory-trained Facility Commander Wnx and Avigilon technician to assist, advise and manage installing personnel.

B. All of the SECURITY CONTRACTOR'S personnel and operating forces including subcontractors and delivery personnel, shall be made aware of, and shall comply at all times, with the regulations, project requirements, and directions of responsible OWNER personnel.

3.3 PERSONNEL

A. The SECURITY CONTRACTOR’S personnel shall be qualified to accomplish all work promptly and satisfactorily. The CONTRACTOR shall be advised of designated service and support personnel responsible for warranty service.

B. The SECURITY CONTRACTOR may be asked provide proof that designated service and support personnel have successfully completed the appropriate level of both hardware and software training and certification offered by the manufacturer for installation and maintenance of the specified system.

3.4 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."

C. In meetings with the CONTRACTOR, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.6 INSTALLATION

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. The CONTRACTOR shall install all system components and appurtenances in accordance with the manufacturer's specifications, referenced practices, guidelines, and applicable codes. Furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

C. All low voltage wiring outside the control console, cabinets, boxes, and similar enclosures, shall be plenum rated where required by code.

D. All exposed wiring inside and outside the control console, cabinets, boxes, and similar enclosures, shall be dressed down neatly and secured with wiring cleats or wire ties.

E. All exposed metallic flexible conduit and armored cable shall be dressed down neatly and secured with low profile, metal fasteners.

F. All cabinets, boxes, and similar enclosures containing security system components and/or cabling and which are easily accessible to employees or to the public shall be

provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible.

G. All junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamper proof screws.

H. End-of-Line resistors shall be installed at the field device location and not at the controller panel location.

I. System devices identified on building drawings are intended to generally indicate areas where such devices are to be located. Security Contractor shall be responsible for determining final location of these devices in accordance with OWNER'S requirements.

J. Riser diagrams are schematic and do not show every conduit, wire box, fitting, or other accessories. Provide such materials as necessary for a complete and functioning installation. Install in accordance with referenced codes and these specifications. Use weatherproof equipment or covers where installed in areas exposed to weather.

3.7 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.8 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Division 26 Section "Electrical Identification" and with TIA/EIA 606-A.

B. Using software, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software and drawings shall reflect as-built conditions.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Correct all deficiencies found in testing and retest.

3.10 CLEANING

A. Clean factory finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch up paint.

3.11 COMMISSIONING AND TRAINING

A. The SECURITY CONTRATOR is required to place entire system into full and proper operation as designed and specified.

B. Verify that all hardware components are properly installed, connected, communicating, and operating correctly.

C. Verify that all system software is installed, configured, and complies with specified functional requirements.

D. The SECURITY CONTRACTOR shall perform final acceptance testing executing a point by point inspection that demonstrates compliance with system requirements as designed and specified:

E. Conduct final acceptance tests verifying that each device point and sequence is operating correctly and properly reporting back to control panel and control center.

F. The system shall not be considered accepted until all acceptance test items have been successfully checked-off. All access control power supplies, panel(s) and door sub component sets shall be labeled with a unique barcode identifier used to log the inspection/checkout and stored in the web based software system Building Reports.com and provide a report to the OWNER.

G. The SECURITY CONTRACTOR shall provide system operations, administration, and maintenance training by factory trained personnel qualified to instruct:

H. OWNER will designate personnel to be trained.

I. Provide printed materials for each trainee including product manuals.

J. Provide hands-on training with operational equipment.

K. Training shall be oriented to the specific system being installed under this contract as designed and specified.

END OF SECTION 287890

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removing existing vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.
6. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 2 inches (50 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials, unless otherwise noted on the Drawings.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Subbase course for concrete walks, pavements.
4. Subbase course and base course for asphalt paving.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect.
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups CL, GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter, unless otherwise noted on the Drawings.

1. Liquid Limit: < 40.
2. Plasticity Index: < 15.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and zero to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches (600 mm) outside of concrete forms other than at footings.
b. 12 inches (300 mm) outside of concrete forms at footings.
c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 20 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill and Final Backfill in accordance with Section 330505, Utility Trench Excavation and Backfll.

F. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 98 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent.

3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.15 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

A. Engage a qualified independent geotechnical testing firm to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Soil treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
2. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

D. Wood Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Termiticide brand name and manufacturer.
3. Quantity of undiluted termiticide used.
4. Dilutions, methods, volumes used, and rates of application.
5. Areas of application.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

1.6 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

1. Service Life of Treatment: Soil treatment termiticide that is effective for not less than three years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
3. Crawlspaces: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
4. Masonry: Treat voids.

5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 ANNUAL INSPECTION

A. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.

END OF SECTION 313116

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.

B. Related Requirements:
1. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
2. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
3. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.3 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.

1. Herbicide.

B. Hot-Mix Asphalt Designs:
1. For each hot-mix asphalt design proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paving-mix manufacturer.

B. Material Certificates

1. Aggregates.
2. Asphalt binder.
3. Asphalt cement.
4. Cutback prime coat.
5. Emulsified asphalt prime coat.

6. Tack coat.
7. Fog seal.
8. Undersealing asphalt.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the West Virginia Division of Highways.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course[and Binder Course]: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use locally available materials and gradations that exhibit a satisfactory record of previous installations. The materials shall conform to the requirements of the indicated subsections of Division 700 of the West Virginia Department of Highways, "Standard Specifications for Roads and Bridges," latest edition.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, and Subsection 703.1-3.

C. Fine Aggregate: ASTM D1073 sharp-edged natural sand or sand prepared from stone, gravel, and Subsection 702.3.

D. Mineral Filler: ASTM D242/D242M, rock or slag dust, hydraulic cement, or other inert material and Subsection 702.4.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D3381/D3381M for viscosity-graded material and Subsection 705.5

B. Water: Potable.

2.3 MIXES

A. Provide plant-mixed, hot-laid asphalt aggregate mixture complying with ASTM D 3515 and the WV Department of Transportation “Standard Specifications for Roads and Bridges” latest edition, and designated for traffic category “Medium”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Herbicide Treatment: Apply herbicide in accordance with manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with ASTM D6927, but not less than 94 percent or greater than 100 percent.
2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:

1. Base Course[and Binder Course]: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course[and Binder Course]: [1/4 inch (6 mm)] <Insert dimension>.
2. Surface Course: [1/8 inch (3 mm)] <Insert dimension>.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Asphalt Traffic-Calming Devices: Compact and form asphalt to the shapes indicated and within a tolerance of plus or minus 1/8 inch (3 mm) of height indicated above pavement surface.

3.10 FIELD QUALITY CONTROL

A. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.

B. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes Concrete Paving, Including the following:
   1. Walks.

B. Related Requirements:

   1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
   2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For the following, from manufacturer:

   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.

5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.7 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

E. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.

F. Plain-Steel Wire: ASTM A 1064/A 1064M, [as drawn] [galvanized].

G. Deformed-Steel Wire: ASTM A 1064/A 1064M.

H. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars[; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating]. Cut bars true to length with ends square and free of burrs.

I. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

J. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

K. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. All concrete materials shall be as specified in Section 330000, “Cast-in-Place Concrete”.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 CONCRETE MIX DESIGN

A. Concrete Mix Design shall be as specified in Section 033000, “Cast-in-Place Concrete”.

B. CONCRETE MIXING

C. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94 and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

    a. Tolerance: Ensure that grooved joints are within 3 inches (75 mm) either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written

instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-feet- (3-m-) long; unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m), 5000 sq. ft. (465 sq. m), or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at 3 days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 3- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Joint-sealant backer materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of joint sealant and accessory.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of

service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.

3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Swing gates.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.
b. Chain-link fabric, reinforcements, and attachments.
c. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of chain-link fence and gate.

B. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

1. Design Wind Load: As indicated on Drawings.

a. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.

C. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire for Fabric: Wire diameter of 0.148 inch.

    a. Mesh Size: 2 inches.
    b. Zinc-Coated Fabric: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. (366 g/sq. m)] with zinc coating applied before weaving.

    c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.

3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:

1. Fence Height: As indicated on Drawings.

2. Horizontal Framework Members: Intermediate and top rails according to ASTM F 1043.

3. Brace Rails: ASTM F 1043.
4. Metallic Coating for Steel Framework:

    a. Type A: Not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating according to ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating according to ASTM A 653/A 653M.
    b. Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
    c. External, Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc-pigmented coating.
    d. Type C: Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
    e. Coatings: Any coating above.

2.4 SWING GATES

A. General: ASTM F 900 for gate posts and single and double swing gate types.

1. Gate Leaf Width: As indicated.
2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework .
2. Gate Posts: Round tubular steel.
3. Gate Frames and Bracing: Round tubular steel.

C. Hardware:

1. Hinges: 180-degree as indicated.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.

2.5 HORIZONTAL CANTILEVER SLIDE GATES

A. General: ASTM F 1184 for gate posts and single sliding gate types. Provide automated vehicular gates according to ASTM F 2200.

1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.

a. Gate Frame Width and Height: As indicated on Drawings.

B. Pipe and Tubing:

1. Zinc-Coated Steel: Manufacturer's standard protective coating and finish.
2. Gate Posts: ASTM F 1184. Provide round tubular steel posts.
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded.

D. Hardware:

1. Hangers, Roller Assemblies, and Stops: Fabricated from galvanized steel.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Lock: Manufacturer's standard internal device.

2.6 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails to posts.

E. Tension and Brace Bands: Pressed steel].

F. Tension Bars: Steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:

a. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of zinc.

2.7 GATE OPERATORS

A. Gate Operator shall be heavy-duty, industrial, gear-driven slide gate operator, LiftMaster Model SL585, or equal, with specifications and accessories as indicated below.

1. 115/208/230V AC, single phase, 60 Hz
2. Operable to -4 degrees F without heater.
3. Motor: Switchless 1 HP, continuous duty.
4. Warranty: 2 years from date of installation.
5. Monitored Retro-Reflective Photo Eyes.
6. Pressure sensitive edge stop to reverse gate when obstructed.
7. KPW250 wireless keypad mounted on 42-inch goose-neck pedestal.
8. Three single button remote control gate openers.
9. CP3 sensing probe for exit detection.

B. Gate operator to be mounted on 6-inch concrete pad in accordance with manufacturer's recommendations.
C. Goose-neck pedestal to be mounted on 12" x 12" x 36" deep concrete foundation in accordance with manufacturer's recommendations.
D. Accessories to be installed in accordance with manufacturer's recommendations.

2.8 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails to posts.

E. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:

a. Hot-Dip Galvanized Steel: 0.106-inch- (2.69-mm-) diameter wire[galvanized coating thickness matching coating thickness of chain-link fence fabric.

F. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of zinc.

2.9 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

2.10 GROUNDING MATERIALS

A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.

1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches (16 by 2440 mm).

2.11 PRIVACY SLATS

A. Fiber-Glass-Reinforced Plastic Slats: UV-light-stabilized fiber-glass-reinforced plastic, not less than 0.06 inch (1.5 mm) thick, sized to fit mesh specified for direction indicated, with vandal-resistant fasteners and lock strips. Slats only where indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend 2 inches (50 mm) above grade; shape and smooth to shed water.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet (152 m), space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 10 feet o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches (1830 mm) or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Intermediate and Bottom Rails: Secure to posts with fittings.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch (50-mm) bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches (380 mm) o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.

3.4 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 GROUNDING AND BONDING

A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fence and Gate Grounding:

1. Ground for fence and fence posts shall be a separate system from ground for gate and gate posts.
2. Install ground rods and connections at maximum intervals of 1500 feet.
3. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet .
4. Ground fence on each side of gates and other fence openings.

    a. Bond metal gates to gate posts.
    b. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches (457 mm) below finished grade.

C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (152 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.

1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
2. Make grounding connections to each barbed tape coil with connectors designed for this purpose.

D. Connections:

1. Make connections with clean, bare metal at points of contact.
2. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
4. Make above-grade ground connections with mechanical fasteners.
5. Make below-grade ground connections with exothermic welds.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

E. Bonding to Lightning Protection System: Ground fence and bond fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor according to NFPA 780.

3.6 FIELD QUALITY CONTROL

A. Prepare test reports.

3.7 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 323113

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Turf renovation.

B. Related Requirements:

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

4. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Grass Seed Mix shall be a mix of turf-type tall fescue with three (3) varieties; turf-type tall fescue, Kentucky Bluegrass, and perennial ryegrass. Final seed mix shall be as directed by the Owner.

2.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES AND NETTING

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Straw netting shall be Curlex Netfree American Excelsior or equal.

2.4 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil as indicated on the Drawings.

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at a total rate as indicated on the Drawings.

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with straw blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.5 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow to a height of 3” to 3.5”.

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft to turf area.

3.6 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.7 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.9 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of planting completion.

    a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION 329200

SECTION 330504 - TESTING SEWER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of testing sewer systems is indicated on drawings and schedules, and by requirements of this section.

B. Type of work in this section includes:

1. Testing Gravity Sewer Systems.
2. Testing Manholes.

1.3 SUBMITTALS

A. Product Data - Submit manufacturer's technical product data and installation instructions for testing sewer system.

B. Shop Drawings - Submit shop drawings for testing sewer system.

C. Complete Record - Submit complete record of all testing activities to the Engineer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TESTING GRAVITY SEWER SYSTEMS

A. General

1. Leakage shall not exceed 50 gallons/inch diameter/mile of sewer/day for any completed gravity sewer.
2. Prior to testing, all sewer lines shall be cleaned and inspected for major defects. Pre-cleaning by high velocity jet or other method may be necessary.
3. Visual testing of all sewer lines shall be performed by the Engineer prior to final acceptance to verify accuracy of alignment and freedom from debris and obstructions. The full diameter of the pipe for straight alignments shall be visible when viewed between consecutive manholes. The method of test shall be either closed circuit television, or visually lamping with mirrors and lights. The Contractor may be required to provide personnel where lamping is performed.
4. The Contractor shall be required to conduct tests to determine the water tightness

of the sewer when completed. The tests shall be observed by the Engineer, but the Contractor shall furnish all labor, equipment and materials required in connection therewith, including the necessary water.

5. As a demonstration of the workmanship and materials proposed to be used, the Contractor shall test the first section before proceeding with construction further than 100 feet. After the first section passes test, construction may resume. The testing operation shall be continuous throughout the construction of the project and at no time during construction shall there be more than 100 feet not tested.
6. The sewer shall be tested in sections, complete with manholes and laterals, and each section extending between the two nearest manholes.
7. It is understood that each section, as above described, must be tested and determined by the Engineer to conform to these specifications before such section or sections are included in any current estimate for payment to the Contractor. It is further understood that, before final acceptance of the project, the Engineer will test all sections of line previously tested. If the leakage does not come within the limits specified, during construction period or at the time of final acceptance of the project, the Contractor will be required to perform such work as may be necessary in order to insure conformance even to the extent of reconstructing the defective section or sections.
8. The Contractor, with approval of the Engineer, may elect to use either an infiltration test, an exfiltration test or an air test, as described below.

B. Air Test

1. The sewer line shall be sealed at each end and tested in sections as previously described. The seal at one end shall have an orifice through which to pass air into the pipe. An air supply shall be connected to the orifice at one end of the line. The air supply line will contain an on-off gas valve, a pressure gauge having a range from 0 to 10 psi and a regulator or relief valve set no higher than 9.0 psi to avoid over-pressurizing and displacing temporary or permanent plugs. The gauge shall have minimum divisions of .10 psi and shall have an accuracy of plus or minus .04 psi. The seals at each manhole shall be properly blocked to prevent displacement while the line is under pressure.
2. The pipe line under test shall be pressurized to four (4) psig. The line will be allowed to stabilize between 4 psig and 3.5 psig for a period of not less than 5 minutes. If necessary, air should be added to the line to maintain the pressure above 3.5 psig. After the stabilization period, the gas valve shall be closed. When the line pressure drops to no less than 3.5 psig, commence timing with a stop watch. The stop watch should be allowed to run until such time as the line pressure drops 1.0 psig. Then the watch should be stopped and the time lapse compared for the 1.0 psig pressure drop with the allowable time lapse in these specifications for the designated pipe size and length specified by the Engineer. If the time lapse is greater than that specified, the section undergoing test shall have passed, and the test may be discontinued at that time. If the time is less than that specified, the line has not passed the test and the Contractor will be required to prepare the line for retest. The test may be discontinued once the prescribed time has elapsed even though the 1.0 psig drop has not occurred.
3. Allowable time lapse shall be as shown in the following Air Test Table.
4. If the pipe line to be tested is beneath the ground water level, the test pressure shall be increased 0.433 psig for each foot the ground water level is above the crown of the pipe, but not greater than 9.0 psig. If the average height of ground water above the pipe invert is greater than 12.7 feet, the section so submerged may be tested using 9.0 psig as the starting test pressure.

C. Exfiltration Test (Upon Engineer's/Owner's Approval Only)

1. Exfiltration testing shall be an acceptable method of leakage test only in dry areas or when ground water level is below the bottom of the pipe throughout the entire length of pipe being tested. Should the Contractor choose to test the completed sewer by exfiltration test, the Contractor shall be responsible for and bear the cost of determination of the ground water level for areas other than dry areas in a manner previously approved by the Engineer.
2. The inlet end of the upstream and downstream manhole shall be closed with a watertight bulkhead, and the sewer along with the upstream manhole shall be filled with water until the elevation of the water in the upstream manhole is 2 feet higher than the top of the pipe in the section being tested, or 2 feet above the existing ground water in the trench, whichever is the higher elevation. The exfiltration will be determined by measuring the amount of water required to maintain the above stated water elevation for a period of one hour from the start of the test. The entire length of section to be tested shall be filled and maintained full of water for a period of approximately 24 hours prior to the start of the test.
3. During exfiltration testing, the maximum internal pipe pressure at the lowest end shall not exceed 25 feet of water or 10.8 psi.
4. The allowable leakage is based on a maximum difference in elevation of eight (8) feet between the level of water at the upper manhole and the invert of the pipe being tested in the lower manhole. If the difference in elevation exceeds eight (8) feet, the allowable leakage shall be increased five percent for each one foot in excess of eight feet.
5. Immediately after the completion of the exfiltration test, if the Engineer desires, the line shall be drained and the infiltration, under existing ground conditions, shall be measured within 3 hours by means of a weir or current meter located in the downstream manhole.

AIR TEST TABLE FOR GRAVITY SEWERS

SPECIFICATIONS TIME REQUIRED
FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED
WHEN TESTING ONE PIPE DIAMETER ONLY

Pipe Diameter (Inches)	*** Minimum Time (Min:Sec)**	**Length For Minimum Time (Feet)**	**** Time For Longer Length (Sec)**	**Specification Time For Length (L) shown (Min:Sec)**							
				100 Ft	*150 Ft*	*200 Ft*	*250 Ft*	*300 Ft*	*350 Ft*	*400 Ft*	*450 Ft*
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	*5:40*	*398*	*.854L*	*5:40*	*5:40*	*5:40*	*5:40*	*5:40*	*5:40*	*5:42*	*6:24*
8	7:34	298	1.520L	7:34	7:34	'7:34	'7:34	7:36	8:52	10:08	11:24
10	*9:26*	*239*	*2.374L*	*9:26*	*9:26*	*9:26*	*9:53*	*11:52*	*13:51*	*15:49*	*17:48*
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	*14:10*	*159*	*5.342L*	*14:10*	*14:10*	*17:48*	*22:15*	*26:42*	*31:09*	*35:36*	*40:04*
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	*19:50*	*114*	*10.470L*	*19:50*	*26:10*	*34:54*	*43:37*	*52:21*	*61:00*	*69:48*	*78:31*
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	*25:30*	*88*	*17.306L*	*28:51*	*43:16*	*57:41*	*72:07*	*86:32*	*100:57*	*115:22*	*129:48*
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	*31:10*	*72*	*25.852L*	*43:05*	*64:38*	*86:10*	*107:43*	*129:16*	*150:43*	*172:21*	*193:53*
36	34:00	66	30.768L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

* If the pipeline to be tested is of shorter length than that shown for Length for Minimum Time, the Minimum Time lapse is required.

** If pipe length to be tested is of greater length than the required length for Minimum Time, the required time shall be determined as indicated.

If the pipe line to be tested is beneath the ground water level, the test pressure shall be increased 0.433 psi for each foot the ground water level is above the crown of the pipe, but not greater than 9.0 psig.

3.2 TESTING MANHOLES

A. General

1. All new manholes shall be tested before final acceptance by the Engineer. The Contractor shall perform and bear all costs of the testing as well as all associated corrective work.
2. Manhole water tightness: All joints, inlets and outlets, joints between frame and manhole section, or any other crack or portal shall be watertight.
3. If, when tested, a manhole fails, the Contractor shall repair, reconstruct or otherwise make satisfactory the manhole, and repeat the tests until that manhole passes.
4. Any infiltration discovered by physical inspection in any manhole during the one year warranty period shall be repaired by the Contractor at no additional cost to Owner.

B. Test Procedures

1. New manholes will be tested for water tightness by one (1) of the following procedures.

a. Vacuum Test

1) Pretest manhole after connections have been made but before initial backfilling is completed.
2) All lift holes and pipe connections shall be plugged prior to the initiation of a vacuum on the manhole.
3) The manhole shall be tested at a vacuum of 10 inches of mercury. Once the vacuum on the manhole stabilizes at 10 inches of mercury, the vacuum pump shall be shut off along with the valve on the vacuum line of the testing apparatus. The length of the test shall be measured for the vacuum to drop from 10 to 9 inches of mercury.
4) The manhole shall be considered passing if the time, in seconds, for the vacuum reading to drop from 10 (4.9 psi) to 9 (4.41 psi) inches of mercury is at least the value indicated in the following table (a pressure drop of 1 inch of mercury is equal to a pressure drop of .49 psi):

b. Exfiltration Test (Upon Engineer's/Owner's Approval Only)

1) This test shall consist of completely sealing all pipe openings into the manhole and filling manhole with water to the top of the casting frame. After the test period, exfiltration is defined as the amount of water required to refill the manhole. Exfiltration shall not exceed 50 gallons per manhole during 24 hour testing period.

Minimum Test Times for Various Manhole Diameters

MH Diameter (Inches)	30	33	36	42	48	54	60	66	72
Depth (Feet)	Time (Seconds)								
8	11	12	14	17	20	23	26	29	32
10	*14*	*15*	*18*	*21*	*25*	*29*	*33*	*36*	*40*
12	17	18	21	26	30	35	39	44	48
14	*20*	*21*	*25*	*30*	*35*	*40*	*46*	*51*	*56*
16	22	24	28	34	40	46	52	58	64

Minimum Test Times for Various Manhole Diameters

MH Diameter (Inches)	30	33	36	42	48	54	60	66	72
Depth (Feet)	Time (Seconds)								
18	*25*	*27*	*32*	*38*	*45*	*52*	*59*	*66*	*73*
20	28	30	35	43	50	58	65	73	81
22	*31*	*33*	*39*	*47*	*55*	*63*	*72*	*80*	*89*
24	34	36	42	51	60	69	78	87	97
26	*36*	*38*	*46*	*55*	*65*	*75*	*85*	*95*	*105*
28	39	41	49	60	70	81	91	102	113
30	*42*	*44*	*53*	*64*	*75*	*87*	*98*	*109*	*121*

END OF SECTION 330504

SECTION 330505 - UTILITY TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Type of work in this section includes:

1. Excavation.
2. Pipe Embedment.

a. Bedding.
b. Haunching and Backfill.

3. Compaction.

1.3 QUALITY ASSURANCE

A. Contractor shall be responsible, financially and otherwise, for (a) all settlement of trench and other backfill which may occur from the time of original backfilling until the expiration of one year after the day of final payment for the entire contract under which the backfilling work was performed, (b) the filling and repair of all backfill settlement and the repair or replacement to the original or a better condition of all pavement, top surfacings, driveways, walks, surface structures, utilities and drainage facilities which have been damaged as a result of backfill replacement operations, and (c) all damage claims or court actions against the Owner for any damage directly or indirectly caused by backfill settlement.

B. Should backfill settlement occur, the Contractor shall make, or cause to be made, all necessary backfill replacements or repairs within fifteen days after verbal or written notice by the Engineer and or the Owner.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for trench excavation and backfill products.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bedding many be any combination of the following natural or man-made well graded materials and shall not contain debris, roots, sticks, timber, wood, trash or organic materials. Bedding shall have 90-100% passing 3/4" sieve and shall

have no more than 10% passing #200 sieve, and shall be well graded to prevent migration.

1. Gravel: 3/4 inch crusher run, natural stone, or creek gravel or other Engineer approved material; free of shale, clay, friable materials and debris.
2. Pea Gravel: Natural stone, free of clay, shale, organic matter; 1/4 inch minimum to 5/8 inch maximum size; graded in accordance with ASTM C136.
3. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ANSI/ASTM C136.

B. Haunching and Initial Backfill

1. Any of the above listed bedding materials.
2. Natural sandy-clay selected from excavation.
3. Natural gravelly-clay selected from excavation.
4. All material shall be less than 3/4" in size.

C. Final Backfill

1. Suitable material removed from the excavation, containing no particles larger than 6" and free from all debris, sticks, timber, wood, trash or organic materials. Material shall not be excessively wet.

D. Concrete

1. Ready Mix - 3000 PSI minimum - ASTM-C94-78a.
2. Reinforcing Rods - ASTM A-36.

PART 3 - EXECUTION

3.1 TRENCH

A. General Construction

1. Excavation shall be made to the lines and grades shown on Construction Drawings.
2. Maintain minimum of 42” cover over all potable waterlines and 36" cover on all gravity sewer lines, unless specifically directed otherwise by the Owner and Architect.
3. Open trench shall be sufficient in advance of pipe laying to expose any obstructions that might alter the alignment of grade but not more than that which can be backfilled at the end of a work day, or 200 feet, whichever is less.
4. Open trench shall not exceed 50 feet in length in a traveled street, roadway or driveway.
5. When working in the stabilized berm along the edge of pavement of a street, or directly through the pavement of a street, where traffic is to be maintained, material excavated from the trench, special fill material, bedding material, stabilizing material, stone, rock, gravel, sand and all other like materials shall not be stockpiled at the excavated area or in

the streets. Contractor shall secure a place near job site where these materials can be stockpiled. Excavation or backfilling of trench will not be permitted during inclement weather, or when existing moisture on the street could combine with any of the above materials and create mud and/or a traffic hazard. The Contractor shall exercise care and see that spills of these materials are quickly removed from the street and sidewalk.

6. Temporary bridges or crossings shall be built by the Contractor where required to maintain traffic or ingress and egress to adjoining property. Fences shall be restored to original condition at no extra cost. The Contractor shall conform to emergency vehicle requirements by maintaining traffic throughways for Ambulance, Fire and Police Departments. The Contractor shall provide access to adjacent property for the duration of the project.
7. All excavation shall be considered unclassified. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated and otherwise removed in the performance of the Work, regardless of type, character, composition, or conditions thereof, without limitation. All blasting required will be the responsibility of the Contractor.

C. Width

1. Shall be a minimum to provide adequate working space and pipe clearance for proper installation, jointing, and embedment. The minimum permissible clear distance between the installed pipe and either trench wall shall be 6 inches.
2. The maximum permissible trench width below an elevation of one foot above the top of the pipe shall be limited to nominal diameter of pipe plus 12 inches on each side of trench wall for depths to 14 feet, and nominal diameter of pipe plus 18 inches on each side of trench wall for depths over 14 feet.
3. Excessive trench widths will not be permitted. Where, for any reason, the width of the trench from bottom of excavation to a point one foot above the top of the pipe exceeds the maximum permitted, either pipe of adequate strength, special pipe embedment, or Class A concrete arch encasement, as required by loading conditions and as determined by the Engineer, shall be furnished and installed by the Contractor at no additional cost to the Owner.

C. Walls

1. It is intended that trench walls shall be substantially vertical, however, the Engineer may grant permission for sloping trench walls. Prior written authorization must be secured by the Contractor before sloping any trench excavation and must be done without additional cost to the Owner or damage to adjacent property. Do not undercut trench walls.

D. Bottom

1. Shall be excavated below pipe invert to provide for bedding material in accordance with Construction Drawings.
2. When rock is encountered, it shall be removed and replaced at the Contractor's expense with bedding material for a thickness of 6 inches

under the pipe bell, or one-fourth the outside diameter of the pipe, whichever is greater.

3. Excavate bell or coupling holes at each joint to provide full strength support of the pipe and to prevent joint loading at the bell or coupling.
4. Contractor shall remove water accumulating in the excavation by pumping or other means approved by the Engineer. Excavation shall be maintained in a relatively dry state while work is in progress.
5. When a firm foundation is not found at grade due to the presence of foreign material, trash, or in the opinion of the Engineer, there is excessive moisture, the unsatisfactory material shall be removed for the width of the pipe plus 18 inches and replaced with suitable earth reflected from adjacent excavation and compacted.
6. If excavation is carried below the depth shown on Construction Drawings for any other reason, the Contractor shall replace over-excavation and compact at his expense to the required grade. Over-excavation of more than 6 inches below the bottom of required grade, but less than 12 inches below the bottom of the required grade, the Contractor shall replace and compact with acceptable embedment material. Over-excavation more than 12 inches below required grade, the Contractor shall replace and compact with material approved by the Engineer at no cost to the Owner.

E. Blasting

1. Blasting of rock shall be allowed by Owner's approval only.
2. Before approval is given, the Contractor shall furnish Certificate of Insurance showing that Public Liability and Property Damage insurance coverage is provided.
3. When allowed, blasting shall be done by licensed blasters, conforming to Federal, State and Local rules and regulations governing the transportation, storage and use of explosives.
4. Excessive blasting or over-shooting will not be permitted. Necessary precautions shall be taken to protect life and property from injury and damage.

3.2 PIPE EMBEDMENT

A. Embedment materials both below and above the bottom of the pipe, the classes of embedment to be used, and the placement and compaction of embedment materials, shall conform to the requirements shown on the Drawings, and to the following supplementary requirements.

1. Embedment Classes

a. Class C Bedding - Unless otherwise indicated, Class C Bedding, in accordance with the detail shown on the Drawings, shall be used for all ductile iron and PVC pipe, except when the actual trench width exceeds the maximum permitted. Where the maximum trench width is thus exceeded, the Contractor shall use Class B bedding, Class A bedding, or a higher strength of pipe as directed by the Engineer to meet the specified requirements.

b. Class B Bedding - shall be used where specifically required by the Drawings or when the actual trench width exceeds the maximum

permitted for Class C Bedding. Where the maximum trench width is thus exceeded, the Contractor shall use Class A bedding, or a higher strength of pipe as directed by the Engineer to meet the specified requirements.

c. Class A Bedding - Concrete Cradle: Shall be used where specifically required by the Drawings or where actual trench width exceeds the maximum permitted for Class B or C bedding, as appropriate and as described by the Engineer.

d. Class A Bedding - Concrete Arch: Shall be used where specifically required by the Drawings or where actual trench width exceeds the maximum permitted for Class B or C bedding, as appropriate and as directed by the Engineer.

e. Class A Bedding - Concrete Encasement: Shall be used wherever required by the Drawings, or where actual trench width exceeds the maximum permitted for Class B or C bedding, as appropriate and as directed by the Engineer.

2. Bedding

a. Bedding shall be deposited and thoroughly tamped, prepared so that the pipe will be true to line and grade, and that uniform and continuous support will be provided. Bell holes shall be hand excavated.

b. After each joint of pipe has been brought to grade, aligned and placed in final position, deposit and densify sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations. Deposit bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

c. Place pipe that is to be bedded in a concrete cradle or encased in concrete in proper position on temporary supports consisting of pre-shaped wood blocks or bricks with wood wedges. When necessary, rigidly anchor or weight the pipe to prevent flotation when the concrete is placed.

d. Place concrete for cradles, arches, or encasement uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than 5 ft. from its point of deposit. Concrete placed beneath the pipe shall be sufficiently workable so that the entire space beneath the pipe can be filled without excessive vibration.

3. Haunching and Backfill

a. Place haunching and initial backfill material on both sides and to a point one foot over the top of the pipe. Material shall be placed uniformly and simultaneously on both sides of the pipe in layers not to exceed 6 inches in depth and thoroughly tamped by mechanical tampers or approved hand tampers.

b. Final material shall be placed in layers approximately 12" in depth and shall be compacted as required by these Specifications. If rock, as permitted by the specifications, is used in the backfill, there shall be sufficient earth material to completely fill the voids between rocks.

c. Excess material not needed for backfill and material unsuitable for backfill shall be removed from the site and disposed of by the Contractor. Additional backfill material, as required to make up deficiencies or to replace unsuitable excavated material, shall be furnished by the Contractor at no extra cost to Owner.

d. Backfill and cleanup shall be carried on expeditiously with construction. Negligence on the part of the Contractor to perform satisfactory cleanup shall be grounds for the Engineer to halt further excavation until backfill and cleanup work is accomplished, and/or to withhold payment for work already completed.

3.3 COMPACTION

A. Compact each layer to required percentage of maximum dry density or relative dry density, in accordance with ASTM D 698: Standard Proctor Density. The Contractor shall perform daily compaction tests at his own expense and shall include one (1) test per 500 LF of trench backfilled or one (1) per day whichever is greater. The Contractor shall perform these tests for each crew that is working on this Contract.

1. Embedment Materials (Bedding, Haunching, and Initial Backfill).

a. Each layer of embedment material shall be compacted to 98 percent of maximum density.

b. Initial testing will be performed at the Contractor's expense to determine if compaction techniques being utilized are adequate and any additional testing will only be required as directed by the Engineer. Contractor shall provide a minimum of 3 compaction tests for each different type of material encountered. If additional testing reveals inadequate compaction, the Contractor will bear the expense of the tests and any necessary corrective work. If additional testing reveals the compaction requirements of the Contact Documents have been satisfied, the Owner will bear the expense of the testing.

2. Final Backfill Material: All trench backfill above pipe embedment shall conform to one of the following specifications.

a. West Virginia Division of Highways Rights-of-Way - The work in, on or along rights-of-way belonging to the West Virginia Division of Highways shall be governed by the rules and regulations of the West Virginia Division of Highways relating to the laying of pipe or construction of other structures on their rights-of-way. The Contractor shall be responsible for complying with said regulations and shall be fully responsible to the West Virginia Division of Highways for any work performed upon these rights-of-way. The Contractor shall bear all costs of any testing required by the WV Division of Highways. The cost of all such work shall be included in the price bid for each linear foot of pipe installed, unless otherwise noted elsewhere in these specifications.

b. Street and Road Rights-of-Way - All backfill for pipe trenches between the ditch lines in street and road rights-of-way shall be

made with an approved granular material and shall be compacted to 95 percent maximum density. If the Contractor elects to use excavated material for backfill he shall mechanically tamp the backfill in layers not exceeding a depth that can be properly compacted by the equipment in use. The Contractor shall demonstrate the compaction technique and provide compaction tests at his expense to determine the depth of layers to be placed.

c. Lawns and Unimproved Areas - All backfill for pipe trenches in lawns and unimproved areas may be placed by any method or combination of methods which will not impose excessive concentrated or unbalanced loads, shock, impact on or displacement of the installed pipe. Backfilling shall be completed in a manner to prevent trench settlement. In fields and unimproved areas, the trench shall be compacted to 90 percent maximum density, or equal to density of adjacent undisturbed material, whichever is greater, and may be mounded. The mounded area shall not impound water or otherwise damage the property through which the pipeline is constructed. The Contractor shall maintain and cleanup all work through the private property and he shall be responsible for any damage. The trenches shall be maintained for a period of one year after acceptance of the entire contract.

END OF SECTION 330505

SECTION 330506 - CONNECTIONS TO EXISTING SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of connections to existing sewers is indicated on the Drawings, and by requirements of this section.

1.3 QUALITY ASSURANCE

A. All completed connections shall meet the watertight standards set forth in "Testing Sewer Systems", Section 330504, and any other field quality control standard set forth elsewhere in these specifications.

1.4 SUBMITTALS

A. Product Data - Submit manufacture's technical product data and installation instructions for connections to existing sewers.

B. Shop Drawings - Submit shop drawings for connections to existing sewers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials required to make the complete connections shall be the same as specified elsewhere in the specifications.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. General Connections

1. As shown on the Drawings or where directed by the Engineer, existing sewers shall be connected to the new sewers or manholes, and/or new sewers shall be connected to existing sewers or manholes.
2. Provisions satisfactory to the Engineer shall be made to handle the flow of existing sewage and prevent disruption of existing utility service. In general, this will require the blocking or plugging of the existing sewer at an adjacent manhole and the re-routing or pumping of sewage to some point of disposal (manhole) further

downstream that will not affect the construction work or present a health hazard.

3. Construction techniques and materials used in making the actual connection shall be the same as for construction of the new sewer.
4. In all cases involving major sewers, a plan and schedule of operation showing the exact procedure to be followed shall be submitted to the Engineer in writing 72 hours prior to the work being performed.
5. Protect existing sewer and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete or other extraneous materials that may accumulate.
6. The Contractor shall be responsible for working with the Local Utility to locate the existing sewer and connection point.
7. Construction techniques and materials used in making the connections shall be the same as for construction of the new sewer.
8. Surface restoration shall be in accordance with the details indicated on the Drawings.

END OF SECTION 330506

SECTION 330531 - PVC SEWER PIPE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of PVC sewer pipe work is indicated on the Drawings, and by requirements of this Section.

B. Refer to Division 1 sections for "Submittals"; not work of this Section.

C. Refer to Section 330504 for "Testing Sewer Systems"; not work of this Section.

D. Refer to Division 31 sections for "Earth Moving"; not work of this Section.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for PVC sewer pipe products.

B. Shop Drawings: Submit shop drawings for PVC sewer pipe, showing piping materials, size, and locations.

C. Certificates of Compliance: Submit copies of certificates of compliance signed by Contractor, and supplier, certifying that materials for each item comply with or exceed specified requirements.

D. Unconnected Wyes and Tees: Submit record of unconnected wyes and Tees at the end of the project.

E. Test Results: Submit record of test results with each payment request.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gravity Sewers:

1. Polyvinyl Chloride Pipe (PVC) and Fittings - SDR 35: Nominal sizes 4”, 6”, 8”, 10”, 12” and 15” shall be manufactured to meet the requirements of ASTM D 3034 and ASTM 1784. Nominal sizes of 18”, 21”, 24”, 27” and 30” shall comply with ASTM F 679, meeting the requirements of cell class 12454-B and classified as type T-1.

Minimum wall stiffness of 46 psi at 5% deflection when tested in accordance with ASTM D 2412.

a. Pipe Joints - ASTM D 3212.
b. Rubber Gaskets - ASTM F 477.

2.2 MANUFACTURE

A. Pipe shall be manufactured from a high density, high molecular weight polyethylene in compliance with the above ASTM specifications.

B. Pipe shipped to the project shall be plainly marked as to type and origin of manufacture. Pipe shall be properly stored and protected to prevent damage, including overexposure to sunlight. The Engineer will reject damaged pipe.

C. Nominal laying lengths of 12.5' and 20' shall be used.

2.3 IDENTIFICATION

A. Plastic Underground Warning Tape: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION – SEWER (Storm – as applicable) LINE BURIED BELOW" and a metallic core encased in a protective jacket for corrosion protection, detectable by metal detector if tape is buried 2'-6" deep.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Gravity Sewers:

1. All Excavation, Preparation of Trench, Bedding and Backfill shall be as specified in Section 330505 for PVC or “flexible” pipe.
2. Alignment

a. The gravity sewer lines shall be installed to the horizontal, or grades, and vertical alignments shown on the Construction Drawings. Any deviation from the alignments shown on the Construction Drawings shall have approval from the Engineer prior to construction.
b. All grades and alignments shall be maintained by the use of a laser beam and transit or other surveying alignment tools. The laser beam shall be specifically suited to pipe laying and shall be set-up according to manufacturers instructions and standard industry practices.
c. The slope of most gravity sewer lines is the minimum allowable and must be maintained. The Contractor, upon completion of pipeline laying from manhole to manhole, shall check the grade of pipe for proper slope before proceeding to next manhole. Failure of the Contractor to verify and correct deviations from established grade, may require removal and replacement of several joints of pipe at the Contractor expense to correct less than minimum grade conditions detected at time of final inspection.

3. All sewer lines shall be laid true to line and grade starting at the lowest manhole or point in the system and working upstream, with the bells of the pipe laid upgrade. The sections of pipe shall be fitted and matched so that when laid in the work they will form a sewer with a smooth and uniform invert from manhole to manhole.
4. Maintain a minimum of 36 inches (91 cm) of cover over the top of the pipe.
5. Each section of pipe shall be inspected for defects before lowering in the trench. The mating surfaces shall be completely cleaned.
6. Immediately prior to joining, the mating surfaces shall be brush coated using the special lubricant supplied by the manufacturer.
7. A lever bar may be required to shove the spigot end "home" in the bell, and if so, a board shall be used to protect the pipe.
8. The interior of the pipe shall be thoroughly cleaned of all dirt, stones, sticks, and other materials as the work progresses, and the exposed ends of all pipe and fittings shall be fully protected by the use of pipe plugs to prevent any material from entering the pipe. All wyes which are installed but not immediately connected shall be plugged with a standard PVC pipe stopper.
9. Where the ends of the pipe project through a manhole or other structure, they shall be neatly cut to fit the inner face of the structure.
10 Wyes or Tees, 4" or 6" service laterals shall be installed at the locations designated by the Engineer. The location of customer sewer laterals when shown on the Drawings, are approximate. The Contractor shall make a reasonable effort to ask each property owner where he desires his sewer lateral to be located and locate the sewer lateral as close as practical to this location, subject to approval by the Construction Representative. Service laterals shall be installed to the property line, unless otherwise indicated on the Drawings. Contractor shall be responsible for installation of the lateral at a depth which is sufficient to serve the building on the property assuming that the sewer is laid from the building to the property line at a 1% grade.
11 Depth of existing plumbing shall be considered in determining the required lateral elevation. Contractor shall relay any lateral at his expense which does not serve its intended purpose. **Saddle taps will not be permitted under any circumstances.**
12. Any laterals not immediately connected shall be marked at the end of the lateral with a 2"x2"x4' (5 cm x 5 cm x 1.2 m) wood stake driven flush to the normal ground level and painted with fluorescent paint. A record of the location of these unconnected laterals shall be maintained by the Contractor.
13. If any section of pipe is out of alignment through improper laying or subsequent movement caused by the backfill operation, the Contractor, at his own expense, shall remove the section or sections and replace them in proper alignment.

3.2 IDENTIFICATION

A. Install continuous plastic underground warning and location tape during backfilling of trench for underground piping. Locate 6 to 8 inches below finished grade, directly over piping.

END OF SECTION 330531

SECTION 330532 - PRESSURE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes water service piping and appurtenances from the source of potable water to service connections, including meter assemblies.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 33 Section for "Utility Trench Excavation and Backfill" required for pressure piping.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for piping, hydrants, valves, valve boxes, water meters, meter boxes including frames and covers, and identification devices.

C. Record drawings at project closeout of installed water service piping and products in accordance with requirements of Division 1.

D. Maintenance data for valves, hydrants, etc. for inclusion in Operation and Maintenance Manuals specified in Division 1 Section "Closeout Procedures".

E. Submit plans to Engineer in writing at least 72 hours in advance of performing major connections to existing utilities.

1.4 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water to the project. Potable water service system materials shall conform to applicable AWWA requirements, and meet National Sanitation Foundation (NSF) approval unless noted otherwise.

B. Comply with manufacturer's requirements for installation and testing of materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves for shipping as follows:

1. Ensure valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends, flange faces, and weld ends.
3. Set valves in best position for handling. Set gate valves closed to prevent rattling.

B. Storage: Use the following precautions for valves during storage:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

C. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate connection to public water main with utility company.

B. Coordinate with other utilities as necessary to complete the work contemplated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to the following:

1. Gate Valves:

a. American Flow Control; Div. of American Cast Iron Pipe Co.
b. Clow Valve Co.; Div. of McWane, Inc.
c. Kennedy Valve; Div. of McWane, Inc.
d. Mueller Co.

2. Dry-Barrel Fire Hydrants:

    a. American Flow Control, Div. of American Cast Iron Pipe Co.
    b. M&H Valve Company.
    c. Kennedy Valve; Div. of McWane, Inc.
    d. Mueller Co.

3. Underground Warning Tapes:

    a. Allen Systems, Inc.; Reef Industries, Inc.
    b. Brady (W.H.) Co.; Signmark Div.
    c. Calpico, Inc.
    d. Carlton Industries, Inc.
    e. EMED Co., Inc.
    f. Seton Name Plate Co.

4. Bronze Corporation Stops and Valves:

    a. Ford Meter Box Co., Inc.
    b. Hays Div.; Romac Industries.
    c. McDonald, A.Y., Mfg. Co.
    d. Mueller-Hersey; A Grinnell Co.

5. Drilling Machine Corporation Stops:

    a. Ford Meter Box Co., Inc.
    b. Hays Div.; Romac Industries.
    c. Mueller-Hersey; A Grinnell Co.

6. Tapping Valves:

    a. Clow Valve Co.; Div. of McWane, Inc.
    b. Kennedy Valve; Div. of McWane, Inc.
    c. Mueller-Hersey; A Grinnell Co.
    d. U.S. Pipe & Foundry Co.

7. Service Saddles:

    a. Ford Meter Box Co., Inc.
    b. Romac Industries, Inc.
    c. Everett J. Prescott, Inc.

8. Water Meters:

    a. Sensus Technologies, Inc.: iPERL, AMR/AMI, Radio Read (Drive by)

9. Copper Setters:

    a. Ford Meter Box Co., Inc.
    b. Approved Equal

10. Meter Pits

    a. Hancor, Inc.
    b. Sonoco Products, Co.

2.2 PIPE AND PIPE FITTINGS

A. General: Pipe and pipe fitting materials shall be compatible with each other and shall be as indicated on the Drawings.

B. Ductile-Iron Pipe: 6 Inches up to 20 Inches, AWWA C151, Class 50; 24 Inch DIP shall be Class 52; 4 Inch DIP shall be Class 51, unless otherwise noted.

1. Lining: AWWA C104, cement mortar.
2. Gaskets: AWWA C111.
3. Ductile-Iron Fittings – 3 inches up to 24 inches: AWWA C153, ductile-iron compact fittings, 350-psi pressure rating. 2 inches: Ductile-iron full body fittings, 350-psi pressure rating in accordance with ANSI/AWWA C110/A21.10.

    a. Lining: AWWA C104, cement mortar.
    b. Gaskets: AWWA C111, rubber.

4. All Ductile Iron Pipe and Fittings shall be installed with polyethylene encasement.

    a. Polyethylene Encasement: The polyethylene encasement shall conform to the latest revision of ANSI/AWWA C105/A21.5 and be constructed of 8-mil linear low-density polyethylene tubes.

        1) Overlaps and ends of the polyethylene encasement shall be secured with adhesive tape supplied by the encasement manufacturer only.
        2) String or plastic tie straps shall be used to help minimize the space between the pipe and the encasement along the pipe barrel, which will be placed every two (2) feet.
        3) Repair cuts, tears, punctures or damage to polyethylene with adhesive tape or adhesive tape and a short length of polyethylene tube cut open.
        4) Polyethylene encasement shall not be used in stream/river crossings or inside of steel casing pipe. The encasement shall end at the nearest joint to either side of the crossing in such a manner as to ensure the encasement extends three (3) feet past the joint.
        5) Caution shall be exercised during backfill operations to avoid damaging the polyethylene.

    b. All Polyethylene Encasement shall be installed according to the brochure entitled “Polyethylene Encasement - Effective, Economical Protection for Ductile Iron Pipe In Corrosive Environments” as published by the Ductile Iron Research Association (DIPRA) and available through their website, www.DIPRA.org.

C. River Crossing Pipe: Pipe – Class 55 minimum, for sizes up to and including 12 inches, shall meet the requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

1. The pipe barrel shall meet the requirements of ANSI A21.51 and the bell, ball and retainer shall meet the requirements of ANSI A21.10.
2. Gaskets: AWWA C111, rubber.

D. PVC (Polyvinyl Chloride) Pipe: 4 Inches and Larger: AWWA C900, Class 305 (DR14) as indicated. PVC pipe with bell end and elastomeric gasket, with plain end for cast-iron or ductile-iron mechanical joint fittings.

1. Gaskets: ASTM F 477, elastomeric seal.
2. Fittings: Use the Mechanical Joint Fittings as specified above for ductile iron pipe.

E. PVC (Polyvinyl Chloride) Pipe: Pipe 3 inches and Smaller: ASTM D2241, Class 315 (SDR 13.5) with bell end and elastomeric gasket:

1. Pipe Joints - ASTM D3139 (Push-On).
2. Rubber Gaskets - ASTM F477, elastomeric seal.
3. Fittings: Use the Mechanical Joint Fittings as specified above for ductile iron pipe. Gaskets for PVC pipe shall be duct tip transition type.
4. Restrained Joint – Restraint Devices for PVC pipe bell joints shall be Uni-Flange Block Buster Series 1350 Pipe Restraint, or approved equal. Restraint Devices for PVC pipe with mechanical joint/push-on fittings shall be Uni-Flange Block Buster Series 1300 Pipe Restraint, or approved equal.

    a. Certa-Lok™ Yelomine™ thrust-restrained PVC pipe in Iron Pipe Sizes (IPS) may be used in place of restrained joint PVC pipe as described above in sizes 2” through 8”, upon approval of the Owner and Engineer.

        1) Pipe Joint - ASTM D 3139 (Lock-Joint).
        2) Rubber Gaskets - ASTM F 477.
        3) Class 200, ASTM 2241; Class 250 SDR 17 for 3-inch and smaller.

F. Service Line Piping: Pipe shall be CTS polyethylene (PE) tubing, SDR 9, 200 psi, conforming to ASTM D2737/AWWA C901. No joint shall be installed between the main service tap and the meter stop.

2.3 VALVES

A. Nonrising Stem Gate Valves 3 Inches and Larger:

1. Valves 3”-30” shall be resilient wedge type, AWWA C515-latest revision, rated for 250 psi cold water working pressure. All ferrous components shall be ductile iron. The words “D.I.” or “Ductile Iron” shall be cast on the valve or stamped on a permanently attached corrosion resistant metal tag.
2. The wedge shall be ductile iron encapsulated with rubber.
3. The wedge shall be symmetrical and seal equally well with flow in either direction.
4. Valves shall be NSF Standard 61 certified.
5. Bolting materials shall be 304 stainless steel and shall develop the physical strength requirements of ASTM A307 and may have either regular square or hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size socket head cap screws, therefore, are not allowed.
6. Operating nut shall be constructed of ductile iron and shall have four flats at stem connection to assure even input torque to the stem.
7. All gaskets shall be pressure energized O-rings.
8. Stem shall be sealed by three O-rings. The top two O-rings shall be replaceable with valve fully open and while subject to full rated working pressure. O-rings set in a cartridge shall not be allowed.

9. Valve shall have thrust washers located with (1) above and (1) below the thrust collar to assure trouble-free operation of the valve.
10. All internal and external surfaces of the valve body and bonnet shall have a fusion-bonded epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly.
11. Valves shall be Series 2500 Ductile Iron Resilient Wedge Gate Valve as manufactured by American Flow Control or equal. Spur gear actuators shall be required for valves 14 inches and larger.

B. Nonrising Stem Gate Valves, 2 Inches and Smaller: MSS SP-80; body and screw bonnet of ASTM B 62 cast bronze; with Class 125 threaded ends, solid wedge, nonrising copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing, and malleable iron handwheel.

C. Valve Boxes and Valve Markers: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve. Where shown on the Drawings, valves shall include an underground utility marker 66 inches in length by 3.75 inches in width, blue in color and marked “WATER VALVE” where indicated on the Drawings. The marker shall be a fiberglass reinforced composite utility marker as manufactured by Carsonite, Inc. or approved equal.

1. Provide two steel tee-handle operating wrenches for each different type valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket fitting valve operating nut.

D. Curb Stops: Bronze body, with ball valve and large wrench hex nut, with inlet and outlet to match service piping material. Type FB1000 as manufactured by Ford Meter Box Co., or equal, designed to withstand pressure up to 250 psi.

E. Service Boxes for Curb Stops: Cast-iron box having telescoping top section of length required for depth of bury of valve and cover having lettering "WATER," and bottom section with base of size to fit over curb stop and barrel approximately 3 inches in diameter.

1. Provide two steel tee-handle shut-off rods for each type of service box. Shut-off rod shall have tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb stop head.

F. Tapping Sleeve and Tapping Valve: Provide a complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. The sleeve and the valve shall be compatible with the tapping machine to be used.

1. Tapping Sleeve: 18-8 stainless steel 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve shall have full gasket (360 pipe coverage) and consist of gridded virgin SBR compounded for water service. Sleeve shall mate with the size and type pipe material being tapped. Outlet flange shall be size required for branch connection. Outlet shall be 18-8 stainless steel schedule 10 for 4" outlets and schedule 5 for all outlets larger than 4". The outlet gaskets shall be Buna-N.

G. Saddle and Corporation Stops: Provide a complete assembly, including service clamp, corporation stop, and bolts and nuts. The clamp and stop shall be compatible with the drilling machine to be used.

1. Saddle: 85-5-5-5 Brass Alloy per ASTM B-62 and AWWA C800 with a Buna-N rubber gasket ASTM D2000, threaded outlet for corporation stop, and threaded end straps. Straps shall be constructed of brass alloy or stainless steel. Saddles shall be Ford 202B or equal.
2. Corporation Stops: Bronze body and ground key plug, with AWWA C800 threaded inlet and outlet to match service piping material.
3. Manifold: Copper with two to four inlets, as required, with ends matching corporation stops, and outlet matching service piping.

2.4 MECHANICAL JOINT RESTRAINT ASSEMBLY

A. All fittings, valves, and mechanical joint end caps on waterlines 4” in diameter and larger, shall be restrained with the following:

1. Design: Restraint devices for nominal pipe sizes 3” through 48” shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10
2. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. For applications requiring restraint 30” and greater, an alternate grade of iron meeting the material requirements of ASTM A536 is acceptable, providing performance requirements. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.
3. Mechanical Join Restraint Assembly shall be MEGALUG® Series 1100 as manufactured by EBAA Iron, Inc., or equal.

2.5 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

2.6 FIRE HYDRANTS

A. Fire hydrants shall meet or exceed AWWA C502, latest revision. Rated working pressure shall be 250 psi, test pressure shall be 500 psi, and hydrants shall include the following specific design criteria:

1. The main valve closure shall be of the compression type. Traffic feature to be designed for easy 360° rotation of nozzle section during field installation.
2. The main valve opening shall not be less than 5 1/4" and be designed so that removal of all working parts can be accomplished without excavating. The bronze seat shall be threaded into mating threads of bronze. The draining system of the hydrant shall be bronze and positively activated by the main operating rod. Hydrant drains shall close completely after no more than three turns of the operating nut. There shall be a minimum of (2) internal ports and

(4) drain port outlets to the exterior of the hydrant. Drain shutoff to be by direct compression closure.

3. Lower hydrant barrel shall be made of centrifugally cast ductile iron.
4. Friction loss not exceed 3.0 psi at 1000 gpm through 4 1/2" pumper nozzle.
5. Finish: Red exterior alkyd gloss enamel paint.
6. Dry-Barrel Fire Hydrants: Two 2-1/2" and one 4-1/2" outlets, 5-1/4" inch main valve, drain valve, and 6-inch mechanical joint inlet.
7. Furnish two hydrant wrenches compatible with hydrant furnished.

B. Hydrants shall be American-Darling B-84-B, as manufactured by American Flow Control, or equal.

2.7 WATER METER

A. General: Provide water meter with registration in gallons.

B. Water Meter - 1 inch: ANSI/AWWA C700 and ANSI/AWWA C-710 for accuracy and pressure loss requirements, electromagnetic meter, 200 psi pressure rating. Meters with stuffing box, spindle and packing gland will not be accepted. The water meter system shall operate up to a working pressure of 200 psi, without leakage or damage to any parts. The accuracy shall not be affected by variation of pressure up to 200 psi. The system shall be fully warranted for a period of 20 years (A prorated warranty is not acceptable), and battery life shall be warranted for a period of 20 years. The meters shall be Sensus iPERL for existing system compatability.

1. Case: The register and measuring element shall be an integrated unit housed within a thermal plastic external casing. The integrated unit will not be removable from the external housing. The systems shall have the size and direction of water flow through the system imprinted on the external housing. Each system must be provided with a replaceable, corrosion-resistant synthetic polymer strainer screen. The meter shall include magnetic tamper and low field alarms that shall indicate any attempt to tamper with the magnetic field of the system.
2. Measuring element: The measuring element shall be made of a non-corrosive, lead-free glass fiber reinforced, PPS (polyphenylene sulfide) based resin. A battery powered magnetic flow sensor utilizing silver/silver chloride electrodes that will be utilized to measure the velocity of the water which is linearly proportional to the volume. The measuring element will have no moving parts and will be specific for each size.
3. Registers: Straight-reading in U.S. Gallons; hermetically sealed to prevent fogging and fluid contact with water being measured; the register must be an electronic device encapsulated in glass with 9 programmable digits utilizing a liquid crystal display (LCD). The display shall have indicators for flow direction, empty pipe, battery life and unit of measurement. The register shall not be removable from the meter sensor and shall utilize a magnetic coupling technology to connect to a touch read or radio read meter reading system in a pit set installation.

C. Pit Set Meter Transceiver: Senses Model 520M or approved equal. The pit meter transceiver antenna shall be designed to be installed through the industry standard 1-3/4" hole in the pit lid with no degradation of transmission range. The pit set meter transceiver antenna unit will be capable of mounting to

various types and thicknesses of pit lids – cast iron, aluminum, concrete, composite, or plastic from ½" to 2 ½" in thickness. The pit set meter transceiver design shall not require the replacement of the pit lid material to plastic to improve the propagation on the RF signal. The device shall be capable of operating at temperatures of -30°F to +165°F (-34°C to +74°C) and be 100% submersible. The Meter Transceiver circuit board and battery will be encapsulated in High Density Polyethylene (HDPE) for superior water ingress protection. The pit set meter transceiver must be suitable for operation in flooded pits and be able to be submerged for extended periods for time. The range will not be affected when the pit is flooded, provided the pit meter transceiver antenna is not submerged under water.

D. Handheld Device (HHD) Meter Reader: Not Applicable to this Contract

E. Meter Box: 18 inch diameter by 24 inches height, white, polyvinyl chloride (PVC) or polyethylene (PE); as manufactured by Hancor, Inc. or equal. The meter pit shall have smooth inner and annular exterior corrugations. Based on ASTM D 2412 at 5% deflection the pipe stiffness for 18-inch meter pits shall be 40 pii. The meter pits shall be notched at 0 and 180 degrees at the base to accommodate inlet and outlet pipes.

F. Concrete Bricks: solid; furnish to support meter box; four per installation.

G. Meter Box Cover: Ford Meter Box Co. A32-T or equal, with 11-1/2 lid opening and 4 inches deep for 18 inch diameter boxes. Cast-iron cover having lettering "WATER METER" with Black E-Coating finish. Meter lid must have one (1) two-inch precast hole for electronic meter reading module.

2.8 WATER METER SETTING

A. Coppersetter: Ford Meter Box Co. 70 Series for use with 1 inch meters.

B. Inlet and Outlet Angle Key Valves shall be Ford Meter Box Co. Pack joint end connections with brace pipe eye and the bar compatible with service pipe being utilized. UL Classified to ANSI/NSF Standard 61. All brass shall be lead free and conform to AWWA Standard C800 (ASTM B-62 and ASTM B-584 UNS NO C83600-85-5-5-5). A Padlock wing for locking the inlet and outlet valves in a closed position shall be provided. The optional drain/test valve shall be provided on outlet. Insert stiffeners shall be used with plastic pipe.

2.9 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW" and a metallic core encased in a protective jacket for corrosion protection, detectable by a metal detector when tape is buried 2'-6" deep.

B. For PVC and HDPE pipe, a 10 gauge insulated copper wire suitable for direct burial shall be run continuously along the pipe and shall be secured to the water line.

1. All splices in the wire shall be made by use of an underground rated and approved watertight splice connector. No twisting of wire ends is permitted.

2. The locator wire shall not be wrapped around the pipe, flanges, bells, valves, or other appurtenances.
3. The Contractor shall perform a continuity test on all locator wire in the presence of the Engineer or the Engineer's representative. If the locator wire is found to not be continuous after testing, the Contractor shall repair or replace the failed segment of the wire.
4. The locator wire shall be accessible above ground at one thousand feet (1,000') intervals. The wire shall be accessed by an approved tracer wire box installed at 1,000' intervals, if no other method of access exists.
5. The color of the tracer wire shall be the same as the underground warning tape described above.
6. The tracer wire shall be as manufactured by Copperhead Industries, LLC of Monticello, MN, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE AND PIPE FITTINGS

A. Ductile-Iron Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA C600.

B. PVC (Polyvinyl Chloride) Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint fittings and rubber gaskets in accordance with AWWA M23 and C600.

C. Depth of Cover: Provide minimum cover over piping of 42 inches below finished grade. Where obstructions are encountered, depth may be greater than 42 inches.

D. Install thrust blocking in accordance with the details shown on the Drawings for pipelines 4" and larger at all bends 11-1/4 degrees or greater, tees, crosses, reducers, plugs, and other fittings.

E. Water Main Connection: Tap water main with size and in location as indicated on the Drawings, and in accordance with the following requirements:
   1. Install tapping sleeve and tapping valve in accordance with manufacturer's installation instructions.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
   4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water service piping.
   5. Install service clamps and corporation stops in size, quantity, and arrangement required by the utility company standards, and in accordance with manufacturer's installation instructions.
   6. Install service clamps on pipe to be tapped. Position outlet for corporation stop.
   7. Install corporate stops into service clamps. Install valve with stem pointing up and with cast-iron valve box.

F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

G. Special Note: All water pipe appurtenances, i.e. valves, hydrant tees, etc. shall be installed at the time of pipe installation. Installation of such by transition couplings or other method after the installation of pipeline will not be permitted.

H. Install water pipe in a continuous manner as much as practical. Avoid random "skipping" sections. Joining of "skipped" sections by means other than using DIP solid sleeves will not be permitted without Engineer's prior approval. The intent of this paragraph is to maintain the integrity of the installed pipeline as a completed system.

3.2 INSTALLATION OF VALVES

A. General Application: Use mechanical joint end valves for 3 inch and larger buried installation. Use threaded and flanged end valves for installation in pits and inside building. Use bronze corporation stops and valves, with ends compatible to piping, for 2 inch and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.

C. Locate valves for easy accessibility for operating purposes.

D. Whenever possible, valves installed within DOH right-of-way will be installed behind ditch lines. When valves must be installed in ditch lines due to lack of space otherwise, valves and valve boxes shall be buried a 12" minimum or as other wise directed by DOH.

3.3 INSTALLATION OF ANCHORAGES

A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.

3.4 APPLICATION OF PROTECTIVE COATINGS

A. Apply full coat of asphalt or other acceptable corrosion-retarding material acceptable for potable water use to surfaces of exposed piping, valves, etc. and any installed ferrous anchorage devices.

3.5 INSTALLATION OF FIRE HYDRANTS

A. AWWA - Type Fire Hydrants: Comply with AWWA M17. Install with gate valve and provisions for drainage as indicated in accordance with Fire Hydrant Assembly detail on the Drawings.

B. All Fire Hydrants that have yet to be approved for use must be covered and identified as being "NOT IN SERVICE". Identification Bags shall be N.I.S. BAGS. N.I.S. BAGS shall be made of 27" x 42" x 4 mil rugged polypropylene material, orange in color and in bold print clearly show in very large, easy-to-read print the words "NOT IN SERVICE". Tie Straps shall be provided to firmly secure bags to the hydrant.

3.6 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 12 to 18 inches below finished grade, directly over piping.

B. Install tracer wire over all PVC and HDPE pipe.

3.7 FIELD QUALITY CONTROL

A. Water for cleaning, flushing, testing and disinfection will be obtained by the Contractor from the Owner's existing system and the Contractor will be required to pay the Owner for such water which cannot be used by the Owner's customers at the rate per thousand gallons of water as shown in the Owner's existing tariff. It shall be the Contractor's responsibility to coordinate such activities and for metering water utilized for such purposes. The Owner will determine the amount of water utilized by the Contractor should the Contractor desire to omit metering such water.

B. Cross-Connection Control. When existing water mains are used to supply test water, the Contractor shall protect the supply system from backflow contamination by temporarily installing a double check-valve assembly between the test and supply main or by other means approved by the Engineer. Prior to pressure and leakage testing, the main under test will be isolated from the supply main.

C. Piping Tests: Conduct piping tests in the presence of the Engineer. The Contractor shall ensure that thrust blocking has sufficiently hardened and the restraining systems will provide adequate restraint prior to pressurizing the pipeline. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.

1. Hydrostatic Test: Comply with procedures described in AWWA C605-94, or as described below:

    a. Test pressure shall be 150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation **and in no case shall the test pressure exceed the design pressure of the pipe, appurtenances, or thrust restraints.**

2. Test pressure shall not vary by more than +5 psi for the duration of the test. Test duration shall be for a minimum of 2 hours for each test section.
3. The Contractor shall furnish the gauges and measuring device for the leakage test, pump, pipe, connections, all other necessary appurtenances required to perform the test.
4. Before applying the test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks to expel air. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the Owner.
5. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced at the Contractor's expense, and the test shall be repeated until it is satisfactory to the Owner.
6. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of

the specified test pressure after the pipe has been filled with water and the air had been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

7. No pipe installation will be accepted if the leakage is greater than that determined by the following leakage tables for PVC and Ductile Iron Pipe:

Allowable Leakage per 1000 ft. of PVC pipe (gph)

Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)				
	4	6	8	10	12
300	0.47	0.70	0.94	1.17	1.40
275	0.45	0.67	0.90	1.12	1.34
250	0.43	0.64	0.85	1.07	1.28
225	0.41	0.61	0.81	1.01	1.22
200	0.38	0.57	0.76	0.96	1.15
175	0.36	0.54	0.72	0.89	1.07
150	0.33	0.50	0.66	0.83	0.99
125	0.30	0.45	0.60	0.76	0.91
100	0.27	0.41	0.54	0.68	0.81
75	0.23	0.35	0.47	0.59	0.70
50	0.19	0.29	0.38	0.48	0.57

Allowable Leakage per 1000 ft. of Ductile Iron Pipe (gph)

Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)							
	4	6	8	10	12	16	18	24
350	0.56	0.84	1.12	1.40	1.69	2.25	2.53	3.37
300	0.52	0.78	1.04	1.30	1.56	2.08	2.34	3.12
275	0.50	0.75	1.00	1.24	1.49	1.99	2.24	2.99
250	0.47	0.71	0.95	1.19	1.42	1.90	2.14	2.85
225	0.45	0.68	0.90	1.13	1.35	1.80	2.03	2.70
200	0.42	0.64	0.85	1.06	1.27	1.70	1.91	2.55
175	0.40	0.60	0.79	0.99	1.19	1.59	1.79	2.38
150	0.37	0.55	0.74	0.92	1.10	1.47	1.66	2.21
125	0.34	0.50	0.67	0.84	1.01	1.34	1.51	2.01
100	0.30	0.45	0.60	0.75	0.90	1.20	1.35	1.80

8. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. of nominal valve size shall be allowed.
9. When hydrants are in the test section, the test shall be made against closed hydrant valves.
10. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than specified, the Contractor shall, at his expense, locate and make approved repairs as necessary until leakage is within the specified allowance.
11. All visible leaks shall be repaired, regardless of leakage.
12. Prepare reports for all testing activities and submit promptly to the Engineer.

a. Valve Tests: Prior to acceptance by the Owner of the completed water piping system, the Contractor will be required to test all main line valves, in a method approved by the Engineer. Leakage allowances will be in accordance with AWWA standards.

3.8 CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge all new water distribution piping systems.
2. All distribution piping greater than 2" shall be "pigged" in the following manner:

a. The Contractor will insert a flexible polyurethane foam "swab" (2 lbs per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe.
b. Cleaning and flushing shall be accomplished by propelling the "swab" down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear.
c. The "swab" shall be style B1 as manufactured by Pipeline Pigging Products Inc. of Houston, Texas, or approved equal.

3. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:

a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

4. Proper disposal of test water shall be the Contractor's responsibility in accordance with AWWA C651, the latest revision.

B. Prepare reports for all purging and disinfecting activities and submit promptly to the Engineer.

END OF SECTION 330532

SECTION 330533 - HPDE SEWER PIPE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of HDPE storm sewer pipe work is indicated on the Drawings, and by requirements of this Section.

B. Refer to Division-1 sections for submittals; not work of this Section.

C. Refer to Division-33 sections for testing sewer systems; not work of this Section.

1.3 QUALITY ASSURANCE

A. The High Density Polyethylene pipe specified in this Section shall utilize watertight joints capable of meeting 10.8 psi water and vacuum testing pressure.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for HDPE sewer pipe products.

B. Shop Drawings: Submit shop drawings for HDPE sewer pipe, showing piping materials, size, and locations.

C. Certificates of Compliance: Submit copies of certificates of compliance signed by Contractor, and supplier, certifying that materials for each item comply with or exceed specified requirements.

D. Test Results: Submit record of test results with each payment request.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering submersible pumps which may be incorporated in the work include, but are not limited to, the following:

1. Advanced Drainage Systems, Inc. (ADS)

2.2 MATERIALS

A. Gravity Sewers:

1. High Density Polyethylene Pipe (HDPE) and Fittings shall be manufactured from a high density, high molecular weight polyethylene and shall meet ASTM D 3350 and AASHTO M294, Type S and AASHTO MP7, Type S. The pipe shall have a smooth interior channel that is chemical and corrosion resistant. Pipe shall be available in sizes 12 to 30 inches.

   a. Rubber Gaskets - Polyisoprene meeting ASTM F477.
   b. Joint Performance – Watertight.
   c. Joining System – Bell and Spigot.

2.3 MANUFACTURER

A. Pipe shall be manufactured from a high density, high molecular weight polyethylene compliance with the above ASTM specifications.

B. Pipe shipped to the project shall be plainly marked as to type and origin of manufacture.

C. Nominal laying lengths of 20' shall be used.

2.4 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - STORM LINE BURIED BELOW" and a metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried 2'-6" deep.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Gravity Sewers:

1. Special Note: The slope of most gravity sewer lines is the minimum allowable and must be maintained. The Contractor, upon completion of pipe line laying from manhole to manhole, manhole to drop inlet, or drop inlet to drop inlet, shall check the grade of pipe for proper slope before proceeding to next manhole. Failure of the Contractor to verify and correct deviations from established grade, may require removal and replacement of several joints of pipe to correct less than minimum grade conditions detected at time of final inspection.
2. Preparation of Trench and Bedding shall be as specified in Section 330505.
3. All sewer lines shall be laid true to line and grade with a laser beam, with bells upgrade. The sections of pipe shall be fitted and matched so that when laid in the work they will form a sewer with a smooth and uniform invert from manhole to manhole.
4. Each section of pipe shall be inspected for defects before lowering in the trench.

The mating surfaces shall be completely cleaned.

5. Immediately prior to joining, the mating surfaces shall be brush coated using the special lubricant supplied by the manufacturer.
6. A lever bar may be required to shove the spigot end "home" in the bell, and if so, a board shall be used to protect the pipe.
7. The interior of the pipe shall be thoroughly cleaned of all dirt, stones, sticks, and other materials as the work progresses, and the exposed ends of all pipe and fittings shall be sully protected to prevent any material from entering the pipe.
8. Where the ends of the pipe project through a manhole or other structure, they shall be neatly cut to fit the inner face of the structure.
9. If any section of pipe is out of alignment through improper laying or subsequent movement caused by the backfill operation, the Contractor, at his own expense, shall remove the section or sections and place them in true alignment.
10. Backfill shall be as specified in Section 330505.

3.2 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic underground warning and location tape during backfilling of trench for underground piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.3 TESTING

A. Testing shall be as specified in Section 330504, "Testing Sewer Systems" and the pipe shall be capable of meeting 10.8 psi water and vacuum testing pressure.

END OF SECTION 330533

SECTION 333913 - MANHOLES, DROP INLETS AND CLEANOUTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of manholes and cleanouts is indicated on drawings and schedules, and by requirements of this section.

B. Type of work in this section include:

1. Pre-Cast Concrete Manholes.
2. Pre-Cast or Cast-in-Place Drop Inlets.
3. Manhole Frames and Covers.
4. Drop Inlet Frame and Grate.
5. Clean-outs.

C. Refer to Division 01 Section for submittals; not work of this Section.

D. Refer to Division 33 Section for earthwork; not work of this Section.

1.3 QUALITY ASSURANCE

A. Manholes shall be constructed to prevent not more than 50 gallons/day of infiltration.

B. Refer to Division-1 section for testing sewer system; not work of this Section.

1.4 SUBMITTALS

A. Product Data. Submit manufacturer's technical product data and installation instructions for precast manholes and cleanouts materials and products.

B. Shop Drawings. Submit shop drawings for precast manholes, drop inlets and cleanouts, showing piping materials, size, locations, and inverts. Include details of precast manhole sections, frames, covers and steps.

C. Materials Certification. Submit copies of materials certificates, signed by material producer and Contractor, certifying that materials for precast manhole sections,

frames, covers, steps and bitumastic paint comply with or exceed specified requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manholes

1. Manhole Base. Reinforced precast concrete riser pipe with integral precast base and invert to form watertight unit, as detailed on the Drawings.
2. Cast-in-place Manhole Base. Cast-in-place reinforced concrete in accordance with Division 3 sections for concrete work.
3. Flat Slab Top. Reinforced precast concrete with a minimum thickness of 6 inches having a 24 inch diameter opening, in accordance with ASTM C478.
4. Manhole Riser Pipe. Reinforced precast concrete, 48 inch (1219 mm) diameter with eccentric cone top having 24 inch (610 mm) diameter opening, in accordance with ASTM C478.
5. Manhole Joints. Tongue and groove in precast wall; O-ring or mastic joint sealing compound, in accordance with Federal Specifications SS-S-00210.
6. Manhole Steps. 12 inch (305mm) fiberglass reinforced plastic, in all manholes, 12" center to center, in compliance with OSHA requirements, and in accordance with ASTM C478.
7. Grade Rings. Precast reinforced concrete donuts with inside opening of 24 inches, in accordance with ASTM C478.
8. Manhole Sleeves (for sanitary sewer manholes only). Flexible synthetic rubber boot type, clamped to pipe by stainless steel strap and draw bolt. Comparable systems are subject to prior approval of Engineer.
9. Sanitary Sewer Manhole Frames and Covers. ASTM A48-83 Class 35B, heavy duty, gray iron, non-rocking bearing surfaces, concealed type pickholes, the words "SANITARY SEWER" cast in 2 inch letters in center of cover, and a 24-inch diameter solid lid. Frames shall have a 1” minimum mud ring, or as an alternative, shall be drilled for a minimum of four (4) 1” diameter stainless steel bolt holes for securing to manhole riser.

    a. Standard Manhole Frame and Grates shall be provided for all manhole locations unless otherwise noted on the Drawings and shall be Neenah R-1765, or approved equal.
    b. Watertight Manhole Frame and Grates shall be provided for manhole locations in areas prone to flooding or subject to surface water ponding and shall be Neenah R-1915-S, or approved equal.
    c. Shallow Manhole Frame and Covers shall be provided for shallow manholes as indicated on the Drawings. The frame shall be casted in the flat top and as manufactured by, but not limited to, one of the following:

        1) Neenah Foundary Company – Model No. R-1579.

10. Storm Sewer Frame and Grate: ASTM 48-83 Class 35B, heavy duty, gray iron, non-rock bearing surfaces, the word "SEWER" cast in 2 inch letters in center of cover and a 24-inch diameter lid. Standard Frame and Grate shall be Neenah R-2501, or approved equal.

2.2 DROP INLETS

A. Precast Concrete Drop Inlets: ASTM C478, precast reinforced concrete, of depth indicated. Base slab and four (4) walls shall have a minimum thickness of 6 inches.

1. Base and Walls. The drop inlets shall be square and the base and walls shall be precasted as one unit, as shown on the Drawings.

B. Cast-in-Place Drop Inlets: Reinforced concrete of dimensions and with appurtenances indicated. Cast-in-Place concrete shall conform to Division 3 sections, concrete work.

1. Bottom and Walls: Reinforced Concrete.
2. Channel and Bench: Concrete.

C. Drop Inlet Frame and Grate: ASTM A48-83, Class 35B, gray iron, heavy duty and shall be Neenah R-3433, or approved equal.

2.3 CONCRETE AND REINFORCEMENT

A. Concrete: Refer to Division 03 sections.

B. Reinforcement: Steel Conforming to the following:

1. Fabric: ASTM A185, weld wire fabric, plain.
2. Reinforcement Bars: ASTM A615, Grade 60, deformed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Manholes shall be placed at locations and grades indicated on the Drawings. Install manhole so that all joints, pipe inlets, and outlets, joints between frame and manhole section, or any other joint, crack, or portal wall shall be watertight.

B. Excavation and backfill for manholes shall be as specified in other Division 2 sections.

C. All manholes shall meet infiltration requirements as specified elsewhere in these specifications.

D. The tops of manholes located in streets, roads, alleys, driveways, sidewalks, or other traveled ways shall be set flush with existing surrounding grade. The tops of new manholes in other areas, not traveled ways, shall be set approximately 3 inches higher than existing surrounding grade, unless directed otherwise by Engineer.

E. Contractor shall mound dirt around the raised manhole top to blend with existing surrounding grade.

F. Construct drop inlets to sizes and shapes indicated on the Drawings.

G. Set frames and grates to elevations indicated.

H. Cleanouts shall be installed and constructed in accordance with details shown on Drawings. Frames and covers with self-sealing lid shall be Neenah R-1976, or approved equal.

END OF SECTION 333913