

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: 10-27-2021

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 0705 0705 LOT2200000003 1	Procurement Folder:	926507
Document Name:	TEST LAB RECONFIGURATION CONSTRUCTION	Reason for Modification:	
Document Description:	TEST LAB RECONFIGURATION CONTRUCTION		
Procurement Type:	Central Purchase Order		
Buyer Name:	Toby L Welch		
Telephone:	(304) 558-8802		
Email:	toby.l.welch@wv.gov		
Shipping Method:	Best Way	Effective Start Date:	
Free on Board:	FOB Dest, Freight Prepaid	Effective End Date:	

1. N. T. T. T. T.	A State of the second state	AT & VENDUR	13		Day 2014	DEPARIMENT CONTACT?
Vendor	r Customer Code:	000000206046	i		Requestor Name:	Jodi R Hash
UNITE	D CONSTRUCTION C	CO INC			Requestor Phone:	(304) 558-0500
3120 N	ORTHWESTERN PIK	Æ			Requestor Email:	jhash@wvlottery.com
	RSBURG		WV	26104		
US						
Vendor	r Contact Phone:	999-999-9999	Extensio	on:		·2·2
Discou	unt Dotails:					
Discou	int Details:					
Discou	int Details: Discount Allowed	Discount Perce	entage	Discount Days	- A	TILE LOCATION
Discou #1	int Details: Discount Allowed No	Discount Perce	entage	Discount Days		FILE LOCATION
Discou #1 #2	Discount Allowed No Not Entered	Discount Perce	entage	Discount Days 0	- F	FILE LOCATION
Discou #1 #2 #3	Int Details: Discount Allowed No Not Entered Not Entered	Discount Perce	entage	Discount Days 0	- F	FILE LOCATION

			SHIP TO			
ACCOUNTS PAYABLE LOTTERY		PURCHASING LOTTERY				
PO BOX 2067		900 PENNSYLVANIA AVE				
CHARLESTON	WV 25327-2067	CHARLESTON	WV 25302			
US		US				

11-5-2021

BAS

Total Order Amount:

\$302,686.00

# Purchasing Division's File Copy

TW 10/22/21		ENTERED
PURCHASING DIVISION AUTHORIZATION DATE:	ATTORNEY GENERAL APPROVAL AS TO FORM DATE: ELECTRONIC SIGNATURE ON FILE	ENCUMBRANCE CERTIFICATION DATE: ELECTRONIC SIGNATURE ON FILE
	11/9/202	

### **Extended Description:**

The Vendor, United Construction Company, Inc. agrees to enter with the Agency, The West Virginia Lottery, into a contract for construction services for renovations for the Test Lab on the 11th floor of The WV Lottery HQ Building located at 900 Pennsylvania Ave, Charleston WV per the specifications, terms and conditions, bid requirements, addendums 1-5, the information from the Project Manual and drawings as developed by: Silling Associates Inc. Engineering of Charleston WV dated: July 23, 2021, the Vendor's submitted bid response date: 10/12/2021 in the amount of: \$302,686.00, all incorporated herein by reference and made apart of hereof as attached hereto.

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
1	72121100	0.00000		0.000000	302686.00
Service From	Service To	Manufacturer	Manufacturer		

Commodity Line Description: Commercial and office building construction services

### **Extended Description:**

WV Lottery HQ Test Lab Renovations, as per Project manual. specifications. and drawings.

	Document Phase	Document Description	Page 3
LOT220000003	Draft	TEST LAB RECONFIGURATION CONTRUCTION	

## ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

### **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)

**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 <u>SEVENTY-FIVE (75)</u> 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.

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 bond 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.

WV CONTRACTOR'S LICENSE

\*\*\*\*\*A vendor submitting a bid bond electronically must include a copy of the bid bond with their submission and will be required to provide the original bond within two (2) business days of original bid opening date.\*\*\*\*

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: 500,000.00 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.

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.

State of West Virginia - WV Lottery must be listed as a certificate holder and additionally insured.

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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 <a href="http://www.state.wv.us/admin/purchase/privacy/default.html">http://www.state.wv.us/admin/purchase/privacy/default.html</a>.

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 hamless 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 <u>purchasing.division@wv.gov.</u>

**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%) Revised 07/01/2021 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 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 Revised 07/01/2021

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.

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**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 the request. Failure to submit the 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.

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## 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 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:

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.

Attach additional pages if necessary

Revised 07/01/2021

**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.

Charlie Taylor, Vice President	
(Name, Title)	
Charlie Taylor, Vice President	
(Printed Name and Title)	
3120 Northwestern Pike, Parkersburg, WV 26104	
(Address)	
304-422-2141 / 304-485-4249	
(Phone Number) / (Fax Number)	
CTaylor@ucciwv.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.

United Construction Company, Inc.

(Company)

Charlie Taylor, Vice President

(Authorized Signature) (Representative Name, Title)

Charlie Taylor, Vice President

(Printed Name and Title of Authorized Representative)

10/22/2021

(Date)

304-422-2141 / 304-485-4249

(Phone Number) (Fax Number)

Revised 07/01/2021

### ADDENDUM ACKNOWLEDGEMENT FORM SOLICITATION NO.: CRFQ LOT22\*1

**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)

[X]	Addendum No. 1	[	]	Addendum No. 6
[χ]	Addendum No. 2	[	]	Addendum No. 7
[X]	Addendum No. 3	[	1	Addendum No. 8
[X]	Addendum No. 4	[	]	Addendum No. 9
١X	Addendum No. 5	[	]	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.

United Construction Company, Inc. Company N

Authorized Signature

10-12-2 Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing. Revised 6/8/2012

## **GENERAL CONSTRUCTION SPECIFICATIONS**

- 1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of the WV Lottery to establish a contract for Test lab renovations. Silling Architects 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 Specification's Manual as defined below.
  - 2.1 "Construction Services" means test lab renovations on the 11<sup>th</sup> floor as more fully described in these specifications and the Specifications/Project Manual.
  - 2.2 "Pricing Page" means the pages contained in wvOASIS, as referenced in the Specifications/Project Manual upon which Vendor should list its proposed contract price for the Construction Services. Vendors submitting paper bids must enter a lump sum Contract Price in the Commodity Line Section.
  - **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 five (5) 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 Revised 10/22/2018

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 (0) zero percent 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 TBD and final completion by TBD. 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.

- 11. **PROJECT PLANS:** Copies of the project plans can be obtained by downloading the bid specifications from the Oasis website.
- 12. 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.
- 13. 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:
  - **13.1.** Vendor must identify principal service personnel which will be issued access cards and/or keys to perform service.
  - **13.2.** Vendor will be responsible for controlling cards and keys and will pay replacement fee, if the cards or keys become lost or stolen.
  - 13.3. Vendor shall notify Agency immediately of any lost, stolen, or missing card or key.
  - 13.4. Anyone performing under this Contract will be subject to Agency's security protocol and procedures.
  - 13.5. Vendor shall inform all staff of Agency's security protocol and procedures.

### **14. MISCELLANEOUS:**

14.1. 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.

<b>Contract Manager:</b>	Charlie Taylor
Telephone Number:	304-488-1511 (cell)
Fax Number:	-485-4249
Email Address:	Taylor@ucciwv.com

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

Name: \_\_\_\_\_\_

Telephone Number:

Fax Number: \_\_\_\_\_

Email Address: \_\_\_\_\_

15. Initial Decision Maker: Silling Architects, the Architect, shall serve as the Initial Decision Maker in matters relating to this contract.

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### REQUEST FOR QUOTATION (11<sup>th</sup> Floor Test Lab Renovations)

### EXHIBIT A PRICING PAGE

### "A" BASE CONTRACT LUMP SUM BID:

The base bid shall consist of all the work described in the Bidding Documents including the plans, Project Manual, specifications, and any Addendums not identified as an added alternate.

\$ 289,890.00

### "B" ADD ALTERNATE NO. 1 LUMP SUM BID:

Alternate 1 shall consist of ceiling height change and addition of bulkhead. Relocate diffuser noted on floor plans outside of raised ceiling area and rework associated ductwork as required. AS INDICATED ON THE ARCHITECTURAL DRAWINGS.

\$ 7,000.00

### "C" ADD ALTERNATE NO.2 LUMP SUM BID:

Alternate 2 shall consist of installing new flat-panel light fixtures as shown on design documents. (Base bid existing lighting to remain) AS INDICATED ON THE ARCHITECTURAL DRAWINGS:

\$ 5,796.00

### Total bid amount is the total of "A" + "B" + "C"

\$ 302,686.00





## **Project Manual**

## Volume 1

## West Virginia Lottery Commission Test Lab Renovations

Charleston, West Virginia



July 23, 2021

### WEST VIRGINIA LOTTERY TEST LAB RENOVATIONS

### **CHARLESTON, WV**

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06 10 00 Rough Carpentry

### **DIVISION 7 THERMAL and MOISTURE**

- 07 21 00 Thermal Insulation
- 07 84 43 Joint Firestopping
- 07 92 00 Joint Sealants

### **DIVISION 8 NOT USED**

### **DIVISION 9 FINISHES**

- 09 22 16 Non Structural Metal Framing
- 09 29 00 Gypsum Board

- 09 29 00 Gypsum Board
- 09 30 00 Ceramic Tile
- 09 51 13 Acoustical Panel Ceiling
- 09 65 13 Resilient Base and Accessories
- 09 65 19 Resilient Floor Tile
- 09 65 36 Static Control Resilient Flooring
- 09 68 13 Tile Carpet
- 09 91 10 Painting

### **DIVISION 10-22 NOT USED**

### **DIVISION 23 HVAC**

- 23 05 00 Common Work Results for HVAC
- 23 05 05 Common HVAC Materials and Methods
- 23 05 13 Common Electrical Requirements for HVAC Equipment
- 23 05 29Hangers, Supports and Anchors
- 23 05 48 Vibration Control
- 23 05 93 Testing, Adjusting & Balancing for HVAC
- 23 07 13 HVAC Duct Insulation
- 23 07 19 Pipe Insulation
- 23 09 00 Electronic Control Systems
- 23 23 00 Refrigerant Piping
- 23 31 13 Metal Ductwork and Accessories
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- 26 05 01 Common Electrical Materials and Methods
- 26 05 19 Low Voltage Electrical Power Conductors and Cables
- 26 05 26 Grounding and Bonding for Electrical Systems
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- 26 24 16 Panelboards
- 26 27 26 Wiring Devices
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- 26 28 16 Enclosed Switches
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- 26 52 13 Emergency and Exit Lighting

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DRAWING NUMBER	TITLE
	Cover Sheet – Drawing Index
A1.0	Demo Floor Plan & Reflected Ceiling Plan
A2.0	New Work Floor Plan & Reflected Ceiling Plan
H1-0	Schedules and Symbol Legend
H2-0	Demo & New Work- Eleventh Floor Plan – Mechanical
H2-1	New Work – Eleventh Floor Plan – Mechanical
Н3-0	HVAC Details and Flow Diagrams
E0-1	Legends & Schedules - Electrical
E1-1	Demolition & Lighting - Eleventh Floor Plan - Electrical
E1-2	Power & Systems - Eleventh Floor Plan - Electrical
E1-3	New Work – Twelfth and Eleventh Floor Plan - Electrical
E2-1	Details – Electrical

# **AIA** Document A201° – 2017

### General Conditions of the Contract for Construction

### for the following PROJECT:

(Name and location or address)

West Virginia Lottery Test Lab Renovations 900 Pennsylvania Avenue Charleston, WV 25302

THE OWNER: (Name, legal status and address)

West Virginia Lottery Commission 900 Pennsylvania Avenue Charleston, WV 25302

THE ARCHITECT: (Name, legal status and address)

Silling Associates, Inc. 405 Capitol Street, Upper Atrium Charleston, WV 25301

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- 15 **CLAIMS AND DISPUTES**

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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.

§ 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

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§ 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 E203TM\_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<sup>™</sup>-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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

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§ 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.

§ 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.

§ 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, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences.

§ 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

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§ 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.

§ 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,

- allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all .1 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
- whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly .3 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

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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

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

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§ 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 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.

### § 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 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

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§ 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.

#### CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS ARTICLE 6 § 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

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§ 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.

§ 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

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§ 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:

- Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to .1 permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or .3 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:

- Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, .1 workers' compensation insurance, and other employee costs approved by the Architect;
- Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or .2 consumed:
- Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor .3 or others;
- Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly .4 related to the change; and
- Costs of supervision and field office personnel directly attributable to the change. .5

§ 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

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§ 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.

§ 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

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§ 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.

§ 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

- defective Work not remedied; .1
- third party claims filed or reasonable evidence indicating probable filing of such claims, unless security .2 acceptable to the Owner is provided by the Contractor;
- failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials .3 or equipment;

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- reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum; .4
- damage to the Owner or a Separate Contractor; .5
- reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid .6 balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- repeated failure to carry out the Work in accordance with the Contract Documents. .7

§ 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

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§ 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

- liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled; 1
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- terms of special warranties required by the Contract Documents; or .3
- audits performed by the Owner, if permitted by the Contract Documents, after final payment. .4

§ 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.

#### PROTECTION OF PERSONS AND PROPERTY ARTICLE 10

#### § 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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- employees on the Work and other persons who may be affected thereby; .1
- the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, .2 under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, .3 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 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.

## § 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

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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 that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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§ 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.

#### **MISCELLANEOUS PROVISIONS** ARTICLE 13

#### § 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.

#### § 13.4 Tests and Inspections

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§ 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.

#### TERMINATION OR SUSPENSION OF THE CONTRACT ARTICLE 14

#### § 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:

- Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be .1 stopped:
- An act of government, such as a declaration of national emergency, that requires all Work to be .2 stopped;
- Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the .3 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
- The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2. .4

§ 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.

§ 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 §.

- repeatedly refuses or fails to supply enough properly skilled workers or proper materials; .1
- fails to make payment to Subcontractors or suppliers in accordance with the respective agreements .2 between the Contractor and the Subcontractors or suppliers;
- repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful .3 orders of a public authority; or
- otherwise is guilty of substantial breach of a provision of the Contract Documents. .4

§ 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:

- Exclude the Contractor from the site and take possession of all materials, equipment, tools, and .1 construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request .3 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
- that an equitable adjustment is made or denied under another provision of the Contract. .2

# § 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

- cease operations as directed by the Owner in the notice; .1
- take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; .2 and
- except for Work directed to be performed prior to the effective date of termination stated in the notice, .3 terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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§ 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.

#### CLAIMS AND DISPUTES ARTICLE 15

## § 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.

§ 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

- damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, .1 business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- damages incurred by the Contractor for principal office expenses including the compensation of .2 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.

§ 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.

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§ 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.

§ 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.

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## § 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 §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.

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§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

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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 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."

## §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 nonbinding 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** 

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

State of West Virginia

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:
Ву:	Ву:
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 20th day of <u>February</u>, 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 BY DEPUTY ATTORNEY GENERAL

# SECTION 011000 - SUMMARY

# PART 1 - GENERAL

# 1.1 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Access to site.
  - 4. Coordination with occupants.
  - 5. Work restrictions.
  - 6. Specification and drawing conventions.
  - 7. Miscellaneous provisions.

# 1.2 PROJECT INFORMATION

- A. Project Identification: West Virginia Lottery Test Lab Renovations.
  - 1. Project Location: 900 Pennsylvania Avenue, Charleston, WV 25302.
- B. Owner: West Virginia Lottery Commission.
- C. Architect: Silling Architects.
- 1.3 WORK COVERED BY CONTRACT DOCUMENTS
  - A. The Work of Project is defined by the Contract Documents dated July 23, 2021 and consists of the following:
    - 1. The project involves selective demolition and renovation of the video test lab facility and office area within the WV Lottery headquarters.
  - B. Type of Contract:
    - 1. Project will be constructed via single prime, General Construction contract.
- 1.4 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 work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

- 1. Limits: Confine construction operations to areas shown to receive work.
- 2. 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.

# 1.5 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: Limit work to normal business working hours of 7:00 a.m. to 6:00 p.m., seven days a week, unless otherwise indicated.
- C. Tobacco Use is Prohibited in the Building: Smoking and tobacco use is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.
- D. Controlled Substances: Use of controlled substances on Project site is not permitted.
- 1.6 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

# 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 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 Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

# 1.3 PROCEDURES

- A. Coordination: Modify 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. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. 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. ADD ALTERNATE NO. 1 Alternate 1 – Ceiling height change and addition of bulkhead. Relocate diffuser noted on floor plans outside of raised ceiling area and rework associated ductwork as required.
  - B. ADD ALTERNATE NO. 2–
    Alternate 2 Install new flat-panel light fixtures as shown on design documents. (base bid existing lighting to remain)

END OF SECTION 012300

# SECTION 012500 - SUBSTITUTION PROCEDURES

# PART 1 - GENERAL

# 1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

# 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 one PDF electronic copy 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 CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination 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 substitution 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.

SUBSTITUTION PROCEDURES

- g. List of similar installations for completed projects with project names and addresses and 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 substitution 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.
- I. 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: 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.

# PART 2 - PRODUCTS

# 2.1 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: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect. Requests prior to award of the Bid will not be reviewed.
  - 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 3 - EXECUTION (Not Used)

END OF SECTION 012500

# SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

# PART 1 - GENERAL

# 1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

# 1.2 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."

# 1.3 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 are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request 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.
    - e. Quotation Form: Use forms acceptable to Architect.
- 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. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
- 7. Proposal Request Form: Use form acceptable to Architect.
- 1.4 CHANGE ORDER PROCEDURES
  - A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

# 1.5 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 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

#### 1.2 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.

#### 1.3 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 days before the date scheduled for submittal of initial Applications for Payment.
- 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. Contractor's name and address.
    - d. 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. Description of the Work.
  - b. Change Orders (numbers) that affect value.
  - c. 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 percent of the Contract Sum.
  - a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
- 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. 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.
- 9. 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.
- 10. 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.

# 1.4 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. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. 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.
- E. 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.

- F. Transmittal: Submit three 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.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- 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. Schedule of unit prices.
  - 5. Submittal schedule (preliminary if not final).
  - 6. List of Contractor's staff assignments.
  - 7. List of Contractor's principal consultants.
  - 8. Copies of building permits.
  - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  - 10. Report of preconstruction conference.
  - 11. Certificates of insurance and insurance policies.
  - 12. Performance and payment bonds.
- 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. 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.

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 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Requests for Information (RFIs).
  - 3. Project meetings.
  - 4. Coordination Drawings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

#### 1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: 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 15 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.

# 1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction 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 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.

#### 1.5 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: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
  - 1. 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 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 10 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 at each job meeting. Software log with not less than the following:
  - 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 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.

# 1.6 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 days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
  - 1. Conduct the conference to review responsibilities and personnel assignments.
  - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, 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.
  - 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. Submittal procedures.
  - k. Preparation of record documents.
  - I. Use of the premises and existing building.
  - m. Work restrictions.
  - n. Working hours.
  - o. Owner's occupancy requirements.
  - p. Responsibility for temporary facilities and controls.
  - q. Procedures for moisture and mold control.
  - r. Procedures for disruptions and shutdowns.
  - s. Parking availability.
  - t. Office, work, and storage areas.
  - u. Equipment deliveries and priorities.
  - v. First aid.
  - w. Security.
  - x. Progress cleaning.
- 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Pre-Installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
  - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Manufacturer's written instructions.
    - b. Warranty requirements.
    - c. Compatibility of materials.
    - d. Acceptability of substrates.
    - e. Temporary facilities and controls.
    - f. Space and access limitations.

- g. Regulations of authorities having jurisdiction.
- h. Testing and inspecting requirements.
- i. Installation procedures.
- j. Coordination with other work.
- k. Required performance results.
- I. Protection of adjacent work.
- m. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
- 5. 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.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 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, Owner's Commissioning Authority, 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. Installation of Owner's furniture, fixtures, and equipment.
    - k. Responsibility for removing temporary facilities and controls.
  - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
  - 1. Coordinate dates of meetings with preparation of payment requests.
  - 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority 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) Status of submittals.
    - 4) Deliveries.
    - 5) Off-site fabrication.
    - 6) Access.
    - 7) Site utilization.
    - 8) Temporary facilities and controls.
    - 9) Progress cleaning.
    - 10) Quality and work standards.
    - 11) Status of correction of deficient items.
    - 12) Field observations.
    - 13) Status of RFIs.
    - 14) Status of proposal requests.
    - 15) Pending changes.
    - 16) Status of Change Orders.
    - 17) Pending claims and disputes.
    - 18) 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.

# 1.7 COORDINATION DRAWINGS 1. COORDINATION DRAWING AND BIM MODEL REQUIREMENTS

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- A. All major sub-contractors will participate in the creation of coordination drawings. Coordination participants include: HVAC Contractor, Plumbing Contractor, Electrical Contractor (including telecom), Fire Protection Contractor and General Trades Contractor.
- B. Coordination Drawings are to be prepared utilizing a Auto-Desk "Revit" three dimensional Building Information Modeling (BIM) software. The Architectural, Mechanical, Plumbing, Fire Suppression, and Electrical Construction Documents were prepared utilizing Revit BIM software. The level of development varies amongst the A/E models and portions of the Construction Documents were not developed three dimensionally. The A/E will share the model information with the Contractors to facilitate the preparation of coordination drawings if requested by the Contractor. The Contractor assumes all responsibility for accuracy, completeness and model level development for development of the Coordination Drawings.
  - 1. The BIM will be developed with true solid modeling, object oriented software. Clash detection software is to be utilized for development of the BIM by all Coordination Participants.
- C. Coordination Drawings are required for all of the building.
  - 1. Field verify all existing conditions when preparing Coordination Drawings in renovated areas. Incorporate findings into the BIM.
- D. The HVAC Contractor shall manage the model and coordinate activities of all Coordination Participants. Each Coordination Participant shall prepare their portion of the Work utilizing BIM and clash detection software utilized by the HVAC Contractor. Each Coordination Participant will obtain or provide at their cost, trained personnel, hardware and software necessary to complete the 3D BIM.
  - 1. Each Coordination Participant is responsible for updating their portion of the Work on a weekly basis and uploading it to the final model.
  - 2. The HVAC Contractor is responsible for producing a weekly updated combined BIM utilizing the clash detection software.
  - 3. Each Coordination Participant shall attend a weekly meeting to identify and resolve spatial interferences. These meetings will be facilitated by the HVAC Contractor. The weekly meetings will be full day working sessions during which conflict resolution will be completed, to the extent possible, during the meeting. The model will be presented onto a common screen for the Coordination Participants to review the progress and facilitate the coordination process.
  - 4. The HVAC Contractor will be responsible for establishing an electronic workspace at the project site facilitating the coordination process, and providing an FTP site or other means, such as an onsite server for the purpose of efficient and timely transfer of coordination files.
  - 5. The Coordination Participants will upload their coordination files as often as necessary to maintain the coordination schedule.
- E. Refer to the General Conditions for additional Coordination Drawing workflow requirements between the various Contractors.

# SCHEDULE 1 - COORDINATION DRAWINGS

- A. Prepare coordination drawings to a scale of ¼ inch equals 1 foot 0 inch or larger, with BIM software, detailing major elements, components and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
  - 1. Indicate the proposed location of piping, ductwork, equipment and materials. Include the following:
    - a. Clearances for installation and maintaining insulation.
    - b. Clearances for servicing and maintaining equipment, including filter removal, and space for equipment disassembly required for periodic maintenance.
    - c. Equipment connections and support details.
    - d. Exterior wall, roof and foundation pene-

trations.

- e. Fire-rated wall and floor penetrations.
- f. Sizes and locations of required concrete pads and bases.
- g. Planned piping layout, including valve and specialty locations and valve stem movement.
- h. Planned duct systems layout, including elbow radii and duct accessories.
- i. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
- j. Equipment service connections and support details.
- k. Mechanical equipment yard with all equipment and underground utilities.
- 2. Indicate scheduling sequencing, movement and positioning of large equipment into or on the building during construction.
- 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- 4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers and other ceiling mounted items.
- 5. Coordinate electrical and mechanical requirements of equipment. Provide necessary changes to comply with manufacturer's requirements.
- 6. Construction documents are diagrammatic. Contractor shall coordinate and provide changes to accommodate minor relocation of equipment.
- 7. HVAC Contractor shall prepare electronic files (PDF format) of Coordination Drawings and submit the files to the Construction Manager, A/E and CxA, if applicable.
  - a. Multiple submissions may be required to resolve different areas of the project and parallel Work Sequence events.

SCHEDULE 2 - APPROVAL

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- A. Each Coordination Participant must sign off on the final Coordination Drawings. This Signature indicates the participating contractor has reviewed and accepted the Coordination Drawings and shall complete installation as indicated on the Coordination Drawings.
- B. After Contractor's written Approval of Coordination Drawings, Contractors and all participants shall be responsible for resolving conflicts and determining the method used to resolve interferences not previously identified.
- C. Modifications required as a result of failure to resolve interferences, shall be paid for by the responsible Contractor.
- PART 2 PRODUCTS (Not Used)
- PART 3 EXECUTION (Not Used)

END OF SECTION 013100

# SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

# PART 1 - GENERAL

#### 1.1 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. Site condition reports.
  - 6. Special reports.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  1. PDF electronic file.
- 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 working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
  - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
  - 3. Total Float Report: List of all activities sorted in ascending order of total float.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.

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- F. Daily Construction Reports: Submit at weekly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.
- I. Qualification Data: For scheduling consultant.

# 1.3 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

## 1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, 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 20 days, unless specifically allowed by Architect.
    - 2. Procurement Activities: Include procurement process activities for the following 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 15 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 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 by Owner: Include a separate activity for each portion of the Work performed by Owner.
  - 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  - 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.
  - 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Mockups.
    - b. Installation.
    - c. Tests and inspections.
    - d. Adjusting.
    - e. Building flush-out.
    - f. 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. Temporary enclosure and space conditioning.
    - b. Permanent space enclosure.
    - c. Completion of mechanical installation.
    - d. Completion of electrical installation.
    - e. Substantial Completion.
- 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.

- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
  - 1. Unresolved issues.
  - 2. Unanswered Requests for Information.
  - 3. Rejected or unreturned submittals.
  - 4. Notations on returned submittals.
  - 5. Pending modifications affecting the Work and Contract Time.
- F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

# 2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for 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 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

# 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
  - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
  - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

- 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
  - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Utility interruptions.
    - d. Installation.
    - e. Work by Owner that may affect or be affected by Contractor's activities.
    - f. Testing and commissioning.
    - g. Punch list and final completion.
  - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  - 3. Processing: Process data to produce output data on a computer-drawn, timescaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
  - 1. Contractor or subcontractor and the Work or activity.
  - 2. Description of activity.
  - 3. Main events of activity.
  - 4. Immediate preceding and succeeding activities.
  - 5. Early and late start dates.
  - 6. Early and late finish dates.
  - 7. Activity duration in workdays.
  - 8. Total float or slack time.
  - 9. Average size of workforce.
  - 10. Dollar value of activity (coordinated with the schedule of values).

- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
  - 1. Identification of activities that have changed.
  - 2. Changes in early and late start dates.
  - 3. Changes in early and late finish dates.
  - 4. Changes in activity durations in workdays.
  - 5. Changes in the critical path.
  - 6. Changes in total float or slack time.
  - 7. Changes in the Contract Time.

#### 2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  - 1. List of subcontractors at Project site.
  - 2. Approximate count of personnel at Project site.
  - 3. Material deliveries.
  - 4. High and low temperatures and general weather conditions, including presence of rain or snow.
  - 5. Accidents.
  - 6. Meetings and significant decisions.
  - 7. Unusual events (see special reports).
  - 8. Stoppages, delays, shortages, and losses.
  - 9. Emergency procedures.
  - 10. Orders and requests of authorities having jurisdiction.
  - 11. Services connected and disconnected.
  - 12. Equipment or system tests and startups.
  - 13. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

#### 2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

# 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 one week 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 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

#### 1.2 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. 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.
- C. 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.

#### 1.3 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.

# 1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
  - 1. Architect will not furnish Contractor digital data drawing files of the Contract Drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Architect.
    - c. Contractor shall pay Architect \$ 100.00 per sheet of electronic CAD files as listed below.
    - d. If requested, the following digital data files will by furnished for each appropriate discipline at the fee listed above:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.
- B. 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.

- C. 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 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 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 21 days for initial review of each submittal.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file 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.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
  - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  - 4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.
    - h. Submittal purpose and description.
    - i. Specification Section number and title.
    - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - k. Drawing number and detail references, as appropriate.
    - I. Location(s) where product is to be installed, as appropriate.
    - m. Related physical samples submitted directly.
    - n. Indication of full or partial submittal.
    - o. Transmittal number, numbered consecutively.

- p. Submittal and transmittal distribution record.
- q. Other necessary identification.
- r. Remarks.
- 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
  - a. Project name.
  - b. Number and title of appropriate Specification Section.
  - c. Manufacturer name.
  - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. 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.
- H. 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.
- I. 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. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.

- a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- 2. Submit electronic submittals via email as PDF electronic files.
  - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- 3. 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.
  - 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, unless submittal based on Architect's digital data drawing files is otherwise permitted.

- 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 (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
- 3. Submit Shop Drawings in the following format:
  - a. PDF electronic file.
- 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. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  - 4. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

- 5. 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 full set(s) 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.
- 6. 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 sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
    - 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 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 017823 "Operation and Maintenance Data."
- K. 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.

- L. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- M. 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.
- N. 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.
- O. 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 digitally signed PDF electronic file 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.
  - 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.
- 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 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, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.2 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. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. 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.

- E. 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.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. 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).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five 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.

#### 1.3 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.

# 1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

# 1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.6 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.

# 1.7 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 product that are similar in material, design, and extent to those indicated for this Project.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; 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.
- G. 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.
- H. 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.

# 1.8 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. 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, and the Contract Sum will be adjusted by Change Order.

- 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 24 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, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect, Commissioning Authority, 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 qualityassurance 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.
- 1.9 SPECIAL TESTS AND INSPECTIONS
  - A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
- PART 2 PRODUCTS (Not Used)
- PART 3 EXECUTION
- 3.1 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, Commissioning Authority's, reference during normal working hours.

### 3.2 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.

# SECTION 014200 - REFERENCES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

# SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

# PART 1 - GENERAL

# 1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
  - 1. Locations of dust-control partitions at each phase of work.
  - 2. HVAC system isolation schematic drawing.
  - 3. Location of proposed air-filtration system discharge.
  - 4. Waste handling procedures.
  - 5. Other dust-control measures.

#### 1.3 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.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

#### 1.4 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. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

#### 2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment:
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Permanent HVAC System: Use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures"
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

# PART 3 - EXECUTION

#### 3.1 TEMPORARY UTILITY INSTALLATION

- A. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
  - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- B. 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.

# 3.2 SUPPORT FACILITIES INSTALLATION

- A. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- B. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. 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.
  - 2. Maintain and touchup signs so they are legible at all times.

# 3.3 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.
- 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. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- F. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
  - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.

- 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
- 3. Insulate partitions to control noise transmission to occupied areas.
- 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
- 5. Protect air-handling equipment.
- 6. Provide walk-off mats at each entrance through temporary partition.

# 3.4 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.

# SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 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. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process 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 specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

#### 1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed

comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

#### 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.

#### 1.5 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 to determine that products are undamaged and properly protected.
- C. Storage:
  - 1. Store products to allow for inspection and measurement of quantity or counting of units.
  - 2. Store materials in a manner that will not endanger Project structure.
  - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  - 6. Protect stored products from damage and liquids from freezing.

7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

# 1.6 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. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 2. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

# 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 not in conflict with 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.
- B. Product Selection Procedures:
  - 1. Products:
    - a. Non-restricted List: 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. Comply with

requirements in "Comparable Products" Article for consideration of an unnamed product.

# 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: 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 these requirements:
  - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 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.

PART 3 - EXECUTION (Not Used)

# SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 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. Installation of the Work.
  - 3. Cutting and patching.
  - 4. Coordination of Owner-installed products.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.

#### 1.2 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.

#### 1.3 QUALITY ASSURANCE

- A. 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 the following:
    - 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 results 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.
- B. 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.
- C. 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. 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 unacceptable installation tolerances.
  - 3. 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. 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. 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.

# 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 of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- 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 prevent 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. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- 5. 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 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
  - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  - 2. Pre-Installation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

# 3.8 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.

# 3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

# 3.10 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.

# SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

### 1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

#### 1.5 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 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 test/adjust/balance records.
  - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 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.
  - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  - 6. Advise Owner of changeover in heat and other utilities.
  - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 9. Complete final cleaning requirements, including touchup painting.
  - 10. 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 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.

# 1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
  - 1. 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.
  - 2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  - 3. 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.

# 1.7 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. MS Excel electronic file. Architect will return annotated file.

#### 1.8 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 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.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

# 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, eventextured 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. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - I. Wipe surfaces of mechanical and electrical equipment [, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

- o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

#### 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.
  - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

# SECTION 017823 - OPERATION AND MAINTENANCE DATA

# PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.

#### 1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in both of the following formats:
  - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer Comments on draft submittals.
  - 2. One paper copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return the copy.

- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

# PART 2 - PRODUCTS

# 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
- 2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS
  - A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
    - 1. Title page.

- 2. Table of contents.
- 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
- 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
- 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
- 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.
  - 2. Flood.
  - 3. Gas leak.
  - 4. Water leak.
  - 5. Power failure.
  - 6. Water outage.
  - 7. System, subsystem, or equipment failure.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  - 1. Instructions on stopping.
  - 2. Shutdown instructions for each type of emergency.

- 3. Operating instructions for conditions outside normal operating limits.
- 4. Required sequences for electric or electronic systems.
- 5. Special operating instructions and procedures.

# 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - 2. Operating standards.
  - 3. Operating procedures.
  - 4. Operating logs.
  - 5. Wiring diagrams.
  - 6. Control diagrams.
  - 7. Piped system diagrams.
  - 8. Precautions against improper use.
- B. Descriptions: Include the following:
  - 1. Product name and model number. Use designations for products indicated on Contract Documents.
  - 2. Manufacturer's name.
  - 3. Equipment identification with serial number of each component.
  - 4. Equipment function.
  - 5. Operating characteristics.
  - 6. Limiting conditions.
  - 7. Performance curves.
  - 8. Engineering data and tests.
  - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
  - 1. Startup procedures.
  - 2. Equipment or system break-in procedures.
  - 3. Routine and normal operating instructions.
  - 4. Regulation and control procedures.
  - 5. Instructions on stopping.
  - 6. Normal shutdown instructions.
  - 7. Seasonal and weekend operating instructions.
  - 8. Required sequences for electric or electronic systems.
  - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

# 2.5 PRODUCT MAINTENANCE MANUALS

- A. 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.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- 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. Schedule for routine cleaning and maintenance.
  - 4. 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 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.

#### 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of 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.

# PART 3 - EXECUTION

# 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

# SECTION 017839 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.

### 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one paper-copy set(s) of marked-up record prints.
      - Submit PDF electronic files of scanned record prints and one of file prints.
      - 3) Submit record digital data files and one set(s) of plots.
      - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit three paper-copy set(s) of marked-up record prints.
      - Submit PDF electronic files of scanned record prints and three set(s) of prints.
      - 3) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly 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. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - I. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. 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.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
  - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  - 2. Format: Annotated PDF electronic file with comment function enabled.
  - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  - 4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

# 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  - 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
  - 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file.

## 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.
  - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

# 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.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

# SECTION 017900 - DEMONSTRATION AND TRAINING

# PART 1 - GENERAL

## 1.1 SUMMARY

- A. 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 video recordings.

### 1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and 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. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.

### 1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date of video recording.
  - 2. Transcript: Prepared and bound in format matching operation and maintenance manuals. 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.
  - 3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents

with links to corresponding training components. Include name of Project and date of video recording on each page.

4. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

## 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

### 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  - 2. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  - 3. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.
    - i. Operating procedures for emergencies.
    - j. Operating procedures for system, subsystem, or equipment failure.
    - k. Seasonal and weekend operating instructions.
    - I. Required sequences for electric or electronic systems.
    - m. Special operating instructions and procedures.
  - 4. Adjustments: Include the following:

WEST VIRGINIA LOTTERY	
TEST LAB RENOVATIONS	

- a. Alignments.
- b. Checking adjustments.
- c. Noise and vibration adjustments.
- d. Economy and efficiency adjustments.
- 5. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 6. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 7. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

# PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

### 3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

- 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
- 2. Owner will furnish an instructor to describe Owner's operational philosophy.
- 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
- 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS
  - A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
    - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
  - B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
    - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
    - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
    - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
    - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
      - a. Name of Contractor/Installer.
      - b. Business address.
      - c. Business phone number.
      - d. Point of contact.
      - e. E-mail address.

- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
  - 1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
  - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

END OF SECTION 017900

## SECTION 024119 - SELECTIVE DEMOLITION

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected site elements.

#### 1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

#### 1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

#### 1.4 SUBMITTALS

A. 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.

#### 1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped if necessary for reroofing.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

#### 3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
  - 1. Provide at least 3 days notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

## 3.3 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
  - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

### 3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 024119

# SECTION 024121 - CUTTING AND PATCHING

# PART 1 - GENERAL

## 1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

## 1.2 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work. General Contractor is responsible for patching all repair/demo work. Coordinate with mechanical/electrical/plumbing.

### 1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. 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.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.
  - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
    - a. Roofing.
    - b. HVAC enclosures, cabinets, or covers.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

## 3.3 PERFORMANCE

- A. 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 existing 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. Cutting: Cut existing 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 as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
- 3. Concrete Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
- 4. 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.
- 5. Proceed with patching after construction operations requiring cutting are complete.
- C. 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 possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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 eliminate evidence of patching and refinishing.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  - 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 024121

# SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Steel framing and supports for operable partitions.
  - 2. Steel framing and supports for overhead grilles.
  - 3. Steel tube reinforcement for low partitions.
  - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 5. Elevator machine beams, hoist beams, and divider beams.
  - 6. Shelf angles.
  - 7. Metal ladders.
  - 8. Elevator pit sump covers.
  - 9. Miscellaneous steel trim including steel angle corner guards, steel edgings, and bent plate edgings.
  - 10. Metal bollards.
  - 11. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Loose steel lintels.
  - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
  - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

### 1.2 COORDINATION

- 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 metal fabrications that are anchored to or that receive other work. 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.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For the following:1. Paint products.

- 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for all items supplied as part of this section.
- C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- 1.4 INFORMATIONAL SUBMITTALS
  - A. Qualification Data: For professional engineer.
  - B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
  - C. Welding certificates.
  - D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
  - E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

## 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code Stainless Steel."

### 1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

- B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- E. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- F. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- G. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- H. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

- 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Anchors, General: 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/E 488M, conducted by a qualified independent testing agency.
- E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 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.
  - Material for Exterior Locations and Where Stainless Steel Is Indicated: Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

# 2.4 MISCELLANEOUS MATERIALS

- A. 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.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- D. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

### 2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. 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.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 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 welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

### 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous exterior framing and supports where indicated.
- E. Prime miscellaneous framing and supports with primer where indicated.

## 2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

### 2.8 METAL LADDERS

- A. General:
  - 1. Comply with ANSI A14.3, except for elevator pit ladders.
  - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
  - 1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
  - 2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
  - 3. Rungs: 1-inch- (25-mm-) diameter steel bars.
  - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

- 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
- 6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Harsco Industrial IKG, a division of Harsco Corporation.
    - 2) SlipNOT Metal Safety Flooring; W.S. Molnar Company.
- 7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.
- 8. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
- 9. Galvanize and prime and exterior ladders, including brackets.
- C. Aluminum Ladders:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Alco-Lite Industrial Products.
    - b. Halliday Products.
    - c. O'Keeffe's Inc.
    - d. Precision Ladders, LLC.
  - 2. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
  - 3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.
  - 4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch (19 mm) deep and not less than 1/8 inch (3.2 mm) thick, with ribbed tread surfaces.
  - 5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
  - 6. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating] [or] [extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.
  - 7. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted aluminum brackets.

# 2.9 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 3/16-inch (4.8-mm) rolled-steel floor plate with four 1-inch- (25-mm-) diameter holes for water drainage and for lifting.
- B. Provide steel angle supports as indicated.

## 2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.

## 2.11 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 80 steel pipe.
  - 1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
  - 2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
  - 3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
- B. Galvanize and prime bollards.

## 2.12 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize and prime plates.

## 2.13 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.

## 2.14 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.
- 2.15 FINISHES, GENERAL
  - A. Finish metal fabrications after assembly.
  - B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
- 2.16 STEEL AND IRON FINISHES
  - A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
    - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
  - B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
  - C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
    - 1. Shop prime with universal shop primer indicated.
  - D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
    - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
    - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
    - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
    - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
  - E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
    - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.17 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

# PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 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 welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

## 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

- B. Anchor supports for operable partitions and overhead grilles securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

### 3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
  - 1. Do not fill removable bollards with concrete.
- B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.
  - 1. Do not fill removable bollards with concrete.

### 3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

## 3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded 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.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099120 "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

# SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Framing with dimension lumber.
  - 2. Rooftop equipment bases and support curbs.
  - 3. Wood blocking, cants, and nailers.
  - 4. Wood furring and grounds.
  - 5. Wood sleepers.
  - 6. Utility shelving.
  - 7. Plywood backing panels.

### 1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal (114 mm actual) size or greater in least dimension.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. 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, 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.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

### 1.4 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated wood.
  - 2. Fire-retardant-treated wood.
  - 3. Engineered wood products.
  - 4. Shear panels.
  - 5. Power-driven fasteners.
  - 6. Post-installed anchors.
  - 7. Metal framing anchors.

#### 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.
- C. 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, as published by manufacturer, shall 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: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
  - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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 all rough carpentry unless otherwise indicated.
  - 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, furring, stripping, 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 (460 mm) above the ground in crawlspaces or unexcavated areas.

5. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Treatment shall not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
  - 1. Framing for raised platforms.
  - 2. Framing for stages.
  - 3. Concealed blocking.
  - 4. Roof construction.
  - 5. Plywood backing panels.

## 2.4 DIMENSION LUMBER FRAMING

- A. Exposed Framing Indicated to Receive a Stained or Natural Finish: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
  - 1. Species and Grade: Southern pine; No. 1 grade; SPIB.

### 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. Rooftop equipment bases and support curbs.
  - 4. Cants.
  - 5. Furring.
  - 6. Grounds.
  - 7. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:
  1. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Utility Shelving: Lumber with 15 percent maximum moisture content of the following species and grades:
  - 1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. Concealed Boards: 15 percent maximum moisture content and the following species and grades:
  - 1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- E. 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.
- F. 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.
- G. 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 PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

## 2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressurepreservative 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: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

### 2.8 METAL FRAMING ANCHORS

- A. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
  - 1. <u>Cleveland Steel Specialty Co</u>.
  - 2. <u>Simpson Strong-Tie Co., Inc.</u>
  - 3. USP Structural Connectors.
- B. Allowable design loads, as published by manufacturer, shall 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. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- 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 unless otherwise indicated.

- D. 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.
- E. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
  - 1. Width: 3/4 inch (19 mm).
  - 2. Thickness: 0.050 inch (1.3 mm).
  - 3. Length: 16 inches (400 mm).

## PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
  - A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
  - B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
  - C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
  - D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
  - E. Install shear wall panels to comply with manufacturer's written instructions.
  - F. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
  - G. Do not splice structural members between supports unless otherwise indicated.
  - H. 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.
  - I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and 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.
- 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 <u>96 inches</u> (2438 mm) 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 <u>2-inch nominal</u> (<u>38-mm actual</u>) 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.
- J. Sort and select lumber so that natural characteristics do 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.
- K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservativetreated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
  - 3. ICC-ES evaluation report for fastener.
- N. Use steel common 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. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- O. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
  - 1. Comply with approved fastener patterns where applicable.
  - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
  - 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

## 3.2 WOOD 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 16" c.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm).

### 3.4 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 072100 - THERMAL INSULATION

PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Extruded polystyrene foam-plastic board.
  - 2. Glass-fiber blanket.
  - 3. Mineral-wool blanket.
  - 4. Insulating Nail Base.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
  - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

### PART 2 - PRODUCTS

### 2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. DiversiFoam Products.
    - b. Dow Chemical Company (The).
    - c. Owens Corning.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

### 2.2 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Kraft Faced: ASTM C 665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Guardian Building Products, Inc.
    - c. Johns Manville; a Berkshire Hathaway company.
    - d. Knauf Insulation.
    - e. Owens Corning.

### 2.3 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Industrial Insulation Group, LLC (IIG-LLC).
    - b. Roxul Inc.
    - c. Thermafiber, Inc.; an Owens Corning company.

## 2.4 INSULATING NAIL BASE

- A. Insulating Base consisting of Fire Treated Plywood, laminating adhesive, coated glass facer, closed cell polyisocyanuarate Foam Core. System shall be minimum R-value of 19, and 3.0" ISO and 0.625" Plywood.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle Coatings and Waterproofing. R2+
    - b. Or approved equal.

### 2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
  - 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. AGM Industries, Inc.
    - b. Gemco.
  - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
  - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AGM Industries, Inc.
    - b. Gemco.

### 2.6 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flamespread and smoke-developed indexes of 5, per ASTM E 84.
  - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

### PART 3 - EXECUTION

### 3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

#### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- 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. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

## 3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation 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.

### 3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors

according to insulation manufacturer's written instructions for insulation type, thickness, and application.

- 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
- 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
- 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

## 3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
  - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

## 3.6 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 (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
  - 5. 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 equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
- 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

## 3.7 INSTALLATION OF CURTAIN-WALL INSULATION

- A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.
  - 1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
  - 2. Install insulation to fit snugly without bowing.

## 3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

# SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Joints in or between fire-resistance-rated constructions.
  - 2. Joints at exterior curtain-wall/floor intersections.
  - 3. Joints in smoke barriers.

#### 1.2 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at Project site.
- 1.3 ACTION SUBMITTALS
  - A. Product Data: For each type of product.
  - B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency. Fire rating shall be equal to or better than adjacent material fire ratings.
    - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

## 1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

## 1.6 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."

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

## 1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."

## 2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping 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: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. Blazeframe Industries.
    - c. Hilti, Inc.
    - d. Roxul Inc.
    - e. Thermafiber, Inc.; an Owens Corning company.
  - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. Hilti, Inc.
    - c. Roxul Inc.
    - d. Thermafiber, Inc.; an Owens Corning company.
  - 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. Hilti, Inc.
    - c. Roxul Inc.
    - d. Thermafiber, Inc.; an Owens Corning company.
  - 2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- 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. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric 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 elastomeric 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.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
  - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping 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 Joint Firestopping 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.

## 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

## 3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078443

# SECTION 079200 - JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes joint sealants for the following applications:
  - 1. Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
  - 2. Interior joints in vertical surfaces and horizontal non-traffic surfaces.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

#### 1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- 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.
- D. Preconstruction compatibility and adhesion test reports.
- E. Product certificates.

## 1.4 QUALITY ASSURANCE

A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates. 1. Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

## 1.5 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products Selection: Select proposed sealant systems appropriate for joints to be sealed. Submit in accordance with product substitution procedures.

### 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

## 2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Single-Component, Non-sag, Neutral-Curing Silicone Sealant [ES-1]
  - 1. Available Products:
    - a. Dow Corning Corporation; 790.
    - b. Pecora Corporation; 890 NST
    - c. Tremco; Spectrem 1.
  - 2. Type and Grade: S (single component) and NS (non-sag).
  - 3. Class: 25.
  - 4. Use Related to Exposure: NT (non-traffic).
  - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  - 6. Stain-Test-Response Characteristics: Non-staining to concrete and masonry, including brick per ASTM C 510.
- E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant [ES-2]
  - 1. Available Products:
    - a. Dow Corning Corporation; Dow Corning 786
    - b. GE Silicones; Sanitary 1700
    - c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
  - 2. Type and Grade: S (single component) and NS (non-sag).
  - 3. Class: 25.
  - 4. Use Related to Exposure: NT (non-traffic).
  - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- F. Multipart, Pourable Urethane Sealant [ES-3]
  - 1. Available Products:

- a. BASF, Sonneborn Building Products; Sonolastic SL2
- b. Pecora Corporation; NR-200 Urexpan or Dynatred
- c. Tremco, Inc.; Vulkem 245
- 2. Type and Grade: M (multicomponent) and P (pourable).
- 3. Class: 25
- 4. Uses Related to Exposure: T (traffic).
- 5. Uses Related to Joint Substrates: T, M, A, and, as applicable to joint substrates indicated, O.
- G. Multi-component Non-sag Urethane Sealant [ES-4]
  - 1. Available Products:
    - a. BASF; Sonneborn NP2
    - b. Pecora Corporation; Dynatrol II
    - c. Sika Corp.; Sikaflex 2c NS
  - 2. Type and Grade: M (multi-component) and NS (non-sag).
  - 3. Class: 25.
  - 4. Uses Related to Exposure: NT (non-traffic).
  - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- H. Single-Component Non-sag Urethane Sealant [ES-5]
  - 1. Available Products:
    - a. Sika Corporation, Inc.; Sikaflex 1a
    - b. Sonneborn, Division of ChemRex Inc.; Ultra
    - c. Sonneborn, Division of ChemRex Inc.; NP-1
    - d. Tremco; Vulkem 116.
  - 2. Type and Grade: S (single component) and NS (non-sag).
  - 3. Class: 25.
  - 4. Uses Related to Exposure: T (traffic) and NT (non-traffic).
  - 5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

## 2.4 SOLVENT-RELEASE JOINT SEALANTS - [SRS]

- A. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.
  - 1. Available Products:
    - a. Bostik Findley; Bostik 300.
    - b. Fuller, H. B. Company; SC-0296.
    - c. Pecora Corporation; BC-158.
    - d. Tremco; Tremco Butyl Sealant.

## 2.5 LATEX JOINT SEALANTS – [LS]

- A. Latex Sealant: Comply with ASTM C 834, Type O P, Grade NF.
  - 1. Available Products:
    - a. Pecora Corporation; AC-20+.
    - b. BASF; Sonolac.
    - c. Tremco; Tremflex 834.

# 2.6 ACOUSTICAL JOINT SEALANTS – [ACS]

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 1. Available Products:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

## 2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material) or any of the preceding types, 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.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.8 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: Non-staining, 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.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  - 2. Remove laitance and form-release agents from concrete.
    - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- C. 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.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. 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.
- F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.3 JOINT-SEALANT SCHEDULE

A. Exterior Locations:

- 1. Exterior horizontal non-traffic and traffic isolation and contraction joints in cast-inplace concrete slabs, for slopes less than 2%. [ES-4]
- 2. Vertical and cove joints in poured in place concrete and horizontal slopes greater than 2%. [ES-5]
- 3. Exterior perimeter joints between aluminum framing and metal panels [ES-1]
- 4. Joints in sheet metal flashing and metal roof and wall components [ES-3]
- 5. Vertical joints in masonry [ES-1]
- 6. Bedding for exterior thresholds [SRS]
- B. Interior Locations:
  - 1. Joints, perimeter, and penetrations in sound-rated assemblies [ACS]
  - 2. Interior Sanitary Joints: Joints between plumbing fixtures and adjoining floor, wall, and ceiling surfaces [ES-2]
  - 3. Interior porcelain tile expansion, control, contraction and isolation joints in horizontal surfaces [ES-4]
  - 4. Interior perimeter joints of exterior openings [ES-4]
  - 5. Interior vertical control and expansion joints in unit masonry [ES-4]
  - 6. Interior perimeter joints between unit masonry and frames of doors [ES-4]
  - 7. Wall and ceiling joints on exposed surfaces of interior partitions not subject to movement [LS]
  - 8. Wall and ceiling perimeter joints between interior wall surfaces and frames of interior doors and windows [LS]

END OF SECTION 079200

# SECTION 092216 - NON-STRUCTURAL METAL FRAMING

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior ceilings and soffits.
  - 3. Grid suspension systems for gypsum board ceilings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

#### 1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For steel studs, runners and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

### PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, 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.
- C. Horizontal Deflection: For wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 10 lbf/sq. ft. (480 Pa).

## 2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

- 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
- 2. Protective Coating: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use steel studs and runners.
  - 1. Steel Studs and Runners:
    - a. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
      - 1) <u>MBA Building Supplies</u>.
      - 2) MRI Steel Framing, LLC.
      - 3) Phillips Manufacturing Co.
      - 4) <u>Steel Network, Inc. (The)</u>.
    - b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
    - c. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
  - 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
      - 1) <u>Blazeframe Industries</u>.
      - 2) <u>ClarkDietrich Building Systems</u>.
      - 3) <u>Metal-Lite</u>.
      - 4) <u>Steel Network, Inc. (The)</u>.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. <u>Blazeframe Industries</u>.
    - b. <u>ClarkDietrich Building Systems</u>.
    - c. <u>Fire Trak Corp</u>.
    - d. <u>Metal-Lite</u>.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

- 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
  - a. <u>ClarkDietrich Building Systems</u>.
  - b. MRI Steel Framing, LLC.
- 2. Minimum Base-Metal Thickness: 0.0329 inch (0.836 mm).
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. <u>ClarkDietrich Building Systems</u>.
    - b. MRI Steel Framing, LLC.
  - 2. Depth: 1-1/2 inches (38 mm).
  - 3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72mm-) thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. <u>ClarkDietrich Building Systems</u>.
    - b. MRI Steel Framing, LLC.
  - 2. Minimum Base-Metal Thickness: 0.0296 inch (0.752 mm).
  - 3. Depth: As indicated on Drawings.
- H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. <u>ClarkDietrich Building Systems</u>.
    - b. MRI Steel Framing, LLC.
  - 2. Configuration: hat shaped.ZU8
- I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).

- Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. <u>ClarkDietrich Building Systems</u>.
    - b. MRI Steel Framing, LLC.

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
  - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
  - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
  - 1. Depth: 2-1/2 inches (64 mm).
- E. Furring Channels (Furring Members):
  - 1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
  - 2. Steel Studs and Runners: ASTM C 645.
    - a. Minimum Base-Metal Thickness: 0.0269 inch (0.683 mm).
    - b. Depth: As indicated on Drawings.
  - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
    - a. Minimum Base-Metal Thickness: 0.0296 inch (0.752 mm).

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- 4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
  - a. Configuration: hat shaped.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. <u>Armstrong World Industries, Inc</u>.
    - b. <u>Chicago Metallic Corporation</u>.
    - c. <u>United States Gypsum Company</u>.

### 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollowmetal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive

materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

## 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
  - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
  - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
  - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

- 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
- 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
  - a. Install two studs at each jamb unless otherwise indicated.
  - Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
  - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
- 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistancerated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
  - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- 6. Curved Partitions:
  - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
  - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- E. Direct Furring:
  - 1. Screw to wood framing.
  - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Z-Shaped Furring Members:
  - 1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches (610 mm) o.c.
  - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
  - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space

second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

## 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches (1219 mm) o.c.
  - 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
  - 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 5. Do not attach hangers to steel roof deck.
  - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

# SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Tile backing panels.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
- C. Samples for Initial Selection: For each type of trim accessory indicated.

### 1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
  - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

## 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## 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 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. United States Gypsum Company.
  - 2. Thickness: 5/8 inch (15.9 mm).
  - 3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

- B. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. United States Gypsum Company.
  - 2. Thickness: 1/4 inch (6.4 mm).
  - 3. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. United States Gypsum Company.
  - 2. Thickness: 1/2 inch (12.7 mm).
  - 3. Long Edges: Tapered.
- D. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Gypsum.
    - b. CertainTeed Corporation.
    - c. Georgia-Pacific Building Products.
    - d. National Gypsum Company.
    - e. PABCO Gypsum.
    - f. Temple-Inland Building Products by Georgia-Pacific.
    - g. United States Gypsum Company.
  - 2. Core: 5/8 inch (15.9 mm), Type X.
  - 3. Long Edges: Tapered.
  - 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Custom Building Products.
    - c. James Hardie Building Products, Inc.
    - d. National Gypsum Company.
    - e. United States Gypsum Company.
  - 2. Thickness: 5/8 inch (15.9 mm).
  - 3. 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 or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. Expansion (control) joint.
    - e. Curved-Edge Cornerbead: With notched or flexible flanges.

### 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. 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.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

- a. Use setting-type compound for installing paper-faced metal trim accessories.
- 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
- 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
  - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

### 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hilti, Inc.
    - b. Pecora Corporation.
    - c. United States Gypsum Company.
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) 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.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

## 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: As indicated on Drawings.
  - 2. Flexible Type: Apply in double layer at curved assemblies.
  - 3. Ceiling Type: Ceiling surfaces.
  - 4. Mold-Resistant Type: In all bathrooms and areas within 8' of a water source.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
  - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing

member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

- 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
- 3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
  - 1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
  - 2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

### 3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For 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.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

- 1. Cornerbead: Use at outside corners unless otherwise indicated.
- 2. LC-Bead: Use at exposed panel edges.
- 3. L-Bead: Use where indicated.
- 4. Curved-Edge Cornerbead: Use at curved openings.

#### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 3: Ceiling plenum areas, concealed areas, and where indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
  - 2. Level 5: All areas that are exposed to view.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

## 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

## SECTION 093000 - CERAMIC TILE

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Un-glazed and glazed ceramic tile (floor and wall).
  - 2. Metal edge strips installed as part of tile installations.

#### 1.2 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
  - 1. Level Surfaces: Minimum 0.6.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- C. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Metal edge strips in 6-inch (150-mm) lengths.
- D. Qualification Data: For Installer.

### 1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile from one source or producer.

- 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
  - 1. Joint sealants.
  - 2. Metal edge strips.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes in unopened containers and protected from freezing.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

#### 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. 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.

## PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
  - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
  - 3. See Room Finish Schedule for tile and grout specified.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. Provide and install all porcelain and ceramic tile floor and base products as specified in finish schedules and as shown on Plan Enlargements.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

## 2.2 SETTING AND GROUTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
  - 1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
- B. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.
  - 1. Polymer Type: Either ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients, or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
    - a. Unsanded grout mixture for joints 1/8 inch (3.2 mm) and narrower. For joints wider than 1/8 inch use sanded grout.

## 2.3 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- 2.4 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. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, white zinc alloy exposed-edge material.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

## 2.5 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## 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 installed tile.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
  - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
  - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
  - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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, GENERAL

- A. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- 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. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated. See architectural drawings for specific jointing patterns and/or alignment in designated areas. Drawings do not show every cut required.
- E. Lay out tile wainscots to next full tile beyond dimensions indicated.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

- G. Grout tile to comply with requirements of the following tile installation standards:
  - 1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

## 3.4 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
  - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
    - a. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
    - b. Tile floors composed of rib-backed tiles.
- B. Joint Widths: Install tile on floors with the following joint widths:
  - 1. Paver Tile: 1/4 inch (6.35 mm).
- C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- D. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

#### 3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 093000

## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items:
- C. Samples: For each exposed finish.
- D. Product test reports.
- E. Research/evaluation reports.
- F. Maintenance data.

#### 1.3 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.
- B. Fire-Test-Response Characteristics:
  - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
    - a. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.
    - a. Smoke-Developed Index: 450 or less.
- C. Seismic Standard: Comply with the following:

- 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
- 2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Pre-Installation Conference: Conduct conference at Project site.

## 1.4 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
  - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

## PART 2 - PRODUCTS

## 2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Expansion anchors fabricated from corrosion-resistant materials, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- E. Seismic perimeter stabilizer bars, seismic struts, and seismic clips.
- F. 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.

## 2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following: See Room Finish Schedule on the drawings.
- 2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING
  - A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following: See Room Finish Schedule on the drawings.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. 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.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. 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.

ACOUSTICAL PANEL CEILINGS

- 1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
- 2. Do not attach hangers to steel deck tabs or to steel roof deck.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
- 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.

## 3.2 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers:
  - 1. Armstrong World Industries, Inc.
  - 2. Celotex Corporation; Architectural Ceilings Marketing Dept.
  - 3. Chicago Metallic Corporation.
  - 4. USG Interiors, Inc.
- B. 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 fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
  - 1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

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 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

### 1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: 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.

#### 1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

- 2.1 RESILIENT BASE
  - A. Resilient Base:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armstrong World Industries, Inc.
  - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
  - c. Flexco, Inc.
  - d. Johnsonite.
  - e. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
  - 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
  - 2. Manufacturing Method: Group I (solid, homogeneous).
  - 3. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Finish: As selected by Architect from manufacturer's full range.
- I. Colors and Patterns: As selected by Architect from full range of industry colors.

## 2.2 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong World Industries, Inc.
    - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    - c. Flexco, Inc.
    - d. Johnsonite.
    - e. Roppe Corporation, USA.Stair Treads: ASTM F 2169.
  - 3. Type: TS (rubber, vulcanized thermoset).
  - 4. Class: 1 (smooth, flat).
  - 5. Group: 2 (with contrasting color for the visually impaired).
  - 6. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
  - 7. Nosing Height: 1-1/2 inches (38 mm).
  - 8. Thickness: 1/4 inch (6 mm) and tapered to back edge.
  - 9. Size: Lengths and depths to fit each stair tread in one piece.
  - 10. Integral Risers: Smooth, flat; in height that fully covers substrate.

- B. Stringers: Height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
  - 1. Thickness: Manufacturer's standard.
- C. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- D. Locations: Provide rubber stair accessories in areas indicated.
- 2.3 Colors and Patterns: As indicated on the Finish Schedule.

## 2.4 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    - b. Flexco, Inc.
    - c. Johnsonite.
    - d. Roppe Corporation, USA.
- B. Description: Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet and Transition strips.
- C. Material: Rubber.
- D. Profile and Dimensions: As indicated.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Cove Base Adhesives: Not more than 50 g/L.
    - b. Rubber Floor Adhesives: Not more than 60 g/L.

- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stairtread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective liquid floor polish products as 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 Treads and Accessories: 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 manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
  - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
    - a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

#### 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 practicable 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.

#### 3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

## 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
  - 1. Apply three coats select a polish that will be compatible with Owner's polish selection.
- C. Cover resilient products until Substantial Completion.

END OF SECTION 096513

# SECTION 096519 - RESILIENT FLOOR TILE

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Resilient Tile (Solid Vinyl) Flooring.

### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Maintenance Data: For resilient products to include in maintenance manuals.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

#### 1.4 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

### 1.5 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. Floor Tile: Furnish 1 box for every 10 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

## PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
  - A. Johnsonite Inc, Chagrin Falls, OH, www.tarkettna.com.
- 2.2 COLORS AND PATTERNS
  - A. Colors and Patterns: See Room Finish list on Architectural Drawings for selected patterns and colors.
- 2.3 RESILIENT VINYL TILE FLOORING
  - A. Vinyl Floor Tile: ASTM F 1700.
  - B. As indicated by product designations.
  - C. Thickness: 0.125 inch (3.2 mm).
  - D. Size: As designated on drawings.
  - E. Fire-Test-Response Characteristics:
    - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

#### 2.4 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 manufacturer to suit resilient products and substrate conditions indicated.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations 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. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 3. Moisture Testing:
    - a. Perform 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. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
      - Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours -OR-
      - 2) Perform relative humidity test using in situ probes, ASTM F 2170. Must not exceed 80% (For SpraySmart adhesive, 85% RH limit).
- C. 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.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

- 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 TILE INSTALLATION

- A. Lay out 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 in pattern indicated.
- B. Match 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).
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. 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, non-staining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere 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.

## 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
    - a. Do not wash surfaces until after time period recommended by manufacturer.

- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
  - 1. No traffic for 24 hours after installation.
  - 2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
  - 3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
  - 4. Wait 72 Hrs after installation before performing initial cleaning.

END OF SECTION 096519

# SECTION 096536 - STATIC-CONTROL RESILIENT FLOORING

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. Static-dissipative, [solid vinyl floor tile] [rubber floor tile] [vinyl composition floor tile] [vinyl sheet floor covering].
- B. Related Requirements:
  - 1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with static-control resilient flooring.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.
  - 1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
    - a. Examination and preparation of substrates to receive static-control resilient flooring.
    - b. Installation.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. . Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
  - 2. Show locations of inscribed maintenance tiles.
  - 3. Submit grounding diagram showing location of grounding strips and connections.
- C. Samples for Initial Selection: For each type of static-control resilient flooring.

- D. Samples for Verification: For each type of static-control resilient flooring, of size indicated below:
  - 1. Floor Tile: **Full-size 24-by-24-inch** units.
- E. Seam Samples: For seamless-installation technique indicated and for each staticcontrol resilient flooring product, color, and pattern required; with seam running lengthwise and in center of [6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for static-control resilient flooring.
- C. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in 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. Floor Tile: Furnish one box for every [**50**] <**Insert number**> boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
  - Sheet Floor Covering: Furnish not less than [10 linear feet (3 linear m)] <Insert length> for every [500 linear feet (150 linear m)] <Insert length> or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet floor covering installed.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for static-control resilient flooring
  - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

# 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer but not less than **50 deg F** or more than **90 deg F**.
  - 1. Floor Tile: Store on flat surfaces.
  - 2. Sheet Floor Covering: Store rolls upright.

### 1.10 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive static-control resilient flooring during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during static-control resilient flooring installation.
- D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.
- E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
  - 1. Electrical Resistance: Test per [ASTM F 150 with 100-V applied voltage] [ESD-STM-7.1].
    - a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
    - b. Average greater than 1 megohm and less than or equal to 1000 megohms when installed floor coverings are tested surface to ground.
  - 2. Static Generation: Less than [**300**] **<Insert number>** V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
  - 3. Static Decay: 5000 to zero V in less than [**0.25**] <**Insert number**> seconds when tested per FED-STD-101C/4046.1.

- B. Conductive Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
  - 1. Electrical Resistance: Test per [ASTM F 150 with 500-V applied voltage] [ESD-STM-7.1] [NFPA 99, Annex E] [UL 779].
    - a. Average greater than 25,000 ohms and less than 1 megohm when test specimens and installed floor coverings are tested surface to surface (point to point).
    - b. Average greater than 25,000 ohms with no single measurement less than 10,000 ohms when installed floor coverings are tested surface to ground.
  - 2. Static Generation: Less than [**100**] **<Insert number>** V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
  - 3. Static Decay: 5000 to zero V in less than [**0.03**] [**0.01**] <**Insert number**> seconds when tested per FED-STD-101C/4046.1.
- C. Fire-Test-Response Characteristics: 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 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

- A. Static-Dissipative, Solid Vinyl Floor Tile <**Insert drawing designation**>: ASTM F 1700, Class I (monolithic), Type A (smooth surface).
  - 1. <u>Manufacturer Tarkett</u> Style IQ Granit SD
  - 2. Thickness: In manufacturer's standard thickness, but not less than 0.08 inch (2.0 mm).
  - 3. Size: 24 by 24 inches
  - 4. Colors and Patterns: 715 Tapestry

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
- C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.
- D. Integral-Flash-Cove Base Accessories:
  - 1. Cove Strip: 1-inch (25-mm) radius support strip provided or approved by manufacturer.

- 2. Cap Strip: [Square metal, vinyl, or rubber cap] [Tapered vinyl cap] provided or approved by manufacturer.
- 3. Corners: Metal inside and outside corners and end stops provided or approved by floor-covering manufacturer.
- E. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."
- F. Floor Polish: Provide protective, static-control liquid floor polish products as recommended by floor-covering manufacturer.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion or static-control characteristics of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions **and with oversight by manufacturer's representative** to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.
- 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 floor-covering 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 substrates pass testing.
  - 4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisturevapor-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 measurement.

- 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 and remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
  - 1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- F. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

## 3.3 INSTALLATION, GENERAL

- A. Install static-control resilient flooring according to manufacturer's written instructions.
- B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
- C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.
- G. Adhere static-control resilient flooring to substrates using a full spread of static-control 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.
- H. Integral-Flash-Cove Base: Cove static-control flooring **6** inches up vertical surfaces. Support static-control resilient flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
  - 1. Install metal corners at inside and outside corners.

## 3.4 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 floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
  - 1. Lay floor tiles to match existing layout.
- C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
- D. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

## 3.5 SHEET FLOOR-COVERING INSTALLATION

- A. Comply with manufacturer's written instructions for installing sheet floor coverings.
- B. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out sheet floor coverings as follows:
  - 1. Maintain uniformity of sheet floor-covering direction.
  - 2. Minimize number of seams and place them in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor-covering substrates.
  - 3. Match edges of floor coverings for color shading at seams.
  - 4. Avoid cross seams.

#### 3.6 FIELD QUALITY CONTROL

- A. Testing: **Engage** a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.
  - 1. Arrange for testing after static-control adhesives have fully cured and staticcontrol resilient flooring has stabilized to ambient conditions and after ground connections are completed.
  - 2. Arrange for testing of static-control resilient flooring **before and after** performing floor polish procedures.
- B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

## 3.7 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of staticcontrol resilient flooring.
- B. Perform the following operations immediately after completing static-control resilient flooring:
  - 1. Remove static-control adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
  - 1. Do not wax static-control resilient flooring.
  - 2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties; ensure static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
    - a. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.
- D. Cover static-control resilient flooring until Substantial Completion.

END OF SECTION 096536

# SECTION 096813 - TILE CARPETING

## PART 1 - GENERAL

## 1.1 SUMMARY

A. Section includes modular, fusion-bonded carpet tile.

## 1.2 PRE-INSTALLATION MEETINGS

A. Pre-Installation Conference: Conduct conference at Project site.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Type of subfloor.
  - 3. Type of installation.
  - 4. Pattern of installation.
  - 5. Pattern type, location, and direction.
  - 6. Pile direction.
- C. Samples: For each exposed product and for each color and texture specified.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranty.
- 1.5 CLOSEOUT SUBMITTALS
  - A. Maintenance data.

### 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- 1.7 DELIVERY, STORAGE, AND HANDLING
  - A. Comply with CRI 104.
- 1.8 FIELD CONDITIONS
  - A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

#### 1.9 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, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and 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 product indicated on the Room Finish Schedule on Drawings:

#### 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cementbased 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 complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
  - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesives 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."

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- 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. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- F. Installation Method: As recommended in writing by carpet tile manufacturer.
- G. Maintain dye lot integrity. Do not mix dye lots in same area.
- H. 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.
- I. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- K. Install pattern parallel to walls and borders.
- L. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, 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.
- M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096813
# SECTION 099100 - PAINTING (PROFESSIONAL LINE PRODUCTS)

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes surface preparation and field painting of all exposed exterior and interior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Architectural woodwork.
    - b. Acoustical wall panels.
    - c. Toilet enclosures.
    - d. Unit kitchens.
    - e. Finished mechanical and electrical equipment, unless noted otherwise on drawings.
    - f. Light fixtures.
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Ceiling plenums.
    - d. Utility tunnels.
    - e. Pipe spaces.
    - f. Duct shafts.
    - g. Elevator shafts.
  - 3. Finished metal surfaces include the following:

- a. Anodized aluminum.
- b. Stainless steel.
- c. Chromium plate.
- d. Copper and copper alloys.
- e. Bronze and brass.
- 4. Operating parts include moving parts of operating equipment and the following:
  - a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
- 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

#### 1.2 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
  - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  - 3. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.

#### 1.3 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
  - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Initial Selection: For each type of finish-coat material indicated.
  - 1. After color selection, Architect will furnish color chips for surfaces to be coated.

#### 1.4 QUALITY ASSURANCE

A. Applicator 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. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Color name and number.
  - 5. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.
  - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

#### 1.6 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

#### 1.7 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.
  - 1. Quantity: Furnish Owner with an additional 7 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Benjamin Moore & Co. (Benjamin Moore).
  - 2. ICI Dulux Paint Centers (ICI Dulux Paints).
  - 3. PPG Industries, Inc. (Pittsburgh Paints).
  - 4. Sherwin-Williams Co. (Sherwin-Williams).
  - 5. Columbia Paint

#### 2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: See Drawings for selected colors and locations. If manufacturer other than Sherwin Williams is selected, General Contractor must submit proposed color match for approval by Architect.

## 2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
  - 1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than 8.1 mils (0.206 mm).
  - 2. ICI Dulux Paints; Bloxfil 4000-1000 Interior/Exterior Heavy Duty Acrylic Block Filler: Applied at a dry film thickness of not less than 7.0 to 14.5 mils (0.178 to 0.368 mm).

- 3. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils (0.152 to 0.318 mm).
- 4. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils (0.203 mm).

# 2.4 EXTERIOR PRIMERS

- A. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.
  - 1. Benjamin Moore; Moore's Acrylic Masonry Sealer No. 066: Applied at a dry film thickness of not less than 0.7 mils (0.018 mm).
  - 2. ICI Dulux Paints; 2000-1200 Dulux Professional Exterior 100 Percent Acrylic Latex Primer: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
  - 3. Pittsburgh Paints; 6-603 SpeedHide Interior/Exterior Acrylic Latex Alkali Resistant Primer: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  - 4. Sherwin-Williams; Loxon Concrete & Masonry Acrylic Primer A24W8300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- B. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
  - 1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 2. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer. Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 3. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  - 4. Sherwin-Williams; Kem Bond HS Universal Metal Primer B50NZ3/B50WZ4: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- C. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
  - 1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 2. ICI Dulux Paints; 4020-XXXX Devflex DTM Flat Interior/Exterior Waterborne Primer & Finish: Applied at a dry film thickness of not less than 2.2 mils (0.056 mm).
  - 3. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  - 4. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 series. Applied at a dry film thickness of not less than 2.0 mils.

#### 2.5 INTERIOR PRIMERS

- A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
  - 1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
  - 2. ICI Dulux Paints; 3030-1200 Bond-Prep Interior/Exterior Waterborne Pigmented Bonding Primer: Applied at a dry film thickness of not less than 1.8 mils (0.046 mm).
  - 3. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  - 4. Sherwin-Williams; Loxon Concrete & Masonry Acrylic Primer B28W8300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
  - 1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
  - 2. ICI Dulux Paints; 1000-1200 Dulux Ultra Basecoat Interior Latex Wall Primer: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).
  - 3. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  - 4. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series: Applied at a dry film thickness of not less than 1.5 mils (0.041 mm).
- C. Interior Plaster Primer: Factory-formulated latex-based primer for interior application.
  - 1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
  - 2. ICI Dulux Paints; 3210-1200 Ultra-Hide Aquacrylic GRIPPER Stain Killer Primer Sealer: Applied at a dry film thickness of not less than 1.8 mils (0.046 mm).
  - 3. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  - 4. Sherwin-Williams; ; Loxon Concrete & Masonry Acrylic Primer B28W8300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- D. Interior Wood Primer for Acrylic-Enamel and Semi-gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
  - 1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  - 2. ICI Dulux Paints; 3210-1200 Ultra-Hide Aquacrylic GRIPPER Stain Killer Primer Sealer: Applied at a dry film thickness of not less than 1.8 mils (0.046 mm).
  - 3. Pittsburgh Paints; 6-855 SpeedHide Latex Enamel Undercoater: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

- 4. Sherwin-Williams; Premium Interior Wall & Wood Primer B28W8111 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- E. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkydbased metal primer.
  - 1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 2. ICI Dulux Paints; 4130-6130 Devshield Rust Penetrating Metal Primer: Applied at a dry film thickness of not less than 2.2 mils (0.056 mm).
  - 3. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  - 4. Sherwin-Williams; Kem Bond HS Universal Metal Primer B50NZ3/B50WZ4: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- F. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
  - 1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 2. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  - 3. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  - 1. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 series. Applied at a dry film thickness of not less than 2.0 mils.

## 2.6 EXTERIOR FINISH COATS

- A. Exterior Low-Luster Acrylic Paint: Factory-formulated low-sheen (eggshell) acryliclatex paint for exterior application.
  - 1. Benjamin Moore; Moorcraft Super Spec Low Lustre Latex House Paint No. 185: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  - 2. ICI Dulux Paints; 2402-XXXX Dulux Professional Exterior 100 Percent Acrylic Satin Finish: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
  - 3. Pittsburgh Paints; 6-2000 Series SpeedHide Exterior House & Trim Satin--Acrylic Latex: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  - 4. Sherwin-Williams; A-100 Exterior Latex Satin House & Trim Paint A82 Series: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- B. Exterior Semi-gloss Acrylic Enamel: Factory-formulated semi-gloss waterborne acryliclatex enamel for exterior application.
  - 1. Benjamin Moore; Moorcraft Super Spec Latex House & Trim Paint No. 170: Applied at a dry film thickness of not less than 1.1 mils (0.028 mm).

- 2. ICI Dulux Paints; 2406-XXXX Dulux Professional Exterior 100 Percent Acrylic Semi-Gloss Finish: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
- 3. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- 4. Sherwin-Williams; A-100 Latex Gloss A8 Series: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
- C. Exterior Semi-gloss Acrylic Enamel for Ferrous & Miscellaneous Metals (ie; doors, jambs, handrails, etc.): Factory-formulated semigloss acrylic enamel for exterior application.
  - 1. Sherwin-Williams; Pro Industrial High Performance Acrylic Semi-Gloss, B66-650 series. Applied at a dry film of not less than 2.5 mils.

## 2.7 INTERIOR FINISH COATS

- A. Interior Flat Latex-Emulsion Size: Factory-formulated Zero VOC, Anti-Microbial flat latex-based interior paint.
  - 1. Benjamin Moore; Eco Spec WB Silver Interior Latex Flat No. 473: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).
  - 2. ICI Glidden Paints; LifeMaster No VOC Interior Flat Latex Paint, 9100-0110N: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
  - 3. Pittsburgh Paints; 6-4110XI Line SpeedHide Zero VOC Interior Flat-Latex Paint: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  - 4. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat, B30W2650 Series (Remains Zero VOC when tinted, Anti-Microbial): Applied at a dry film thickness of not less than 1.6 mils (0.036 mm).
- B. Interior Low-Luster Acrylic Enamel: Factory-formulated Zero VOC, Anti-Microbial eggshell acrylic-latex interior enamel.
  - 1. Benjamin Moore; Eco Spec WB Silver Interior Latex Eggshell Finish No. 474: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
  - 2. ICI Glidden Paints; LifeMaster No VOC Interior Eggshell, 9300-0110: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
  - 3. Pittsburgh Paints; 6-4310XI Series SpeedHide Zero VOC Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils (0.032 mm).
  - 4. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Eg-Shel B20W2650 Series (remains Zero VOC when tinted, Anti-Microbial): Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- C. Interior Semigloss Acrylic Enamel: Factory-formulated Zero VOC, Anti-Microbial semigloss acrylic-latex enamel for interior application.
  - 1. Benjamin Moore; Eco Spec WB Silver Interior Latex Semi-Gloss Finish No. 476: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).

- 2. ICI Glidden Paints; LifeMaster No VOC Interior Semi-Gloss, 9200-0110N: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- 3. Pittsburgh Paints; 6-4510XI Series SpeedHide Zero VOC Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
- 4. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss B31W2650 Series (Remains Zero VOC when tinted, Anti-Microbial): Applied at a dry film thickness of not less than 1.7 mils (0.033 mm).
- D. Interior Semi-gloss Enamel for Ferrous & Miscellaneous Metals (ie; doors, jambs, handrails, etc.): Factory-formulated semigloss epoxy enamel for interior application.
  - 1. Sherwin-Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-150 series. Applied at a dry film of not less than 1.5 mils.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
  - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

#### 3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

- 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
  - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
    - c. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
    - d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
  - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

- 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
  - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- F. VOC Content: VOC requirements must meet or exceed standards established by the United States Environmental Protection Agency utilizing EPA Test Method 24 for Surface Coatings. VOC ratings are listed on Manufacturers Material Safety Data Sheets in accordance with EPA Test Method 24.
- G. Tints or colorants added should not add VOC's to the products.

## 3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
  - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
  - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  - 3. Provide finish coats that are compatible with primers used.
  - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

- 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
- 10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
  - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  - 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
  - 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  - 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
  - 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  - 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
  - 1. Uninsulated metal piping.
  - 2. Uninsulated plastic piping.
  - 3. Tanks that do not have factory-applied final finishes.
  - 4. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

- 5. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
- 6. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
  - 1. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

#### 3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

#### 3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 099100

# SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

### 1.1 GENERAL REFERENCE

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification sections, apply to work of this section.
- B. Refer to Division 01 section "Alternates" for possible alternates affecting the extent of this Section of work.
- C. This Contractor is also referred to the Architectural, Structural, Electrical and all other drawings and specifications pertinent to this project. All of the above mentioned drawings and specifications are considered a part of the Contract Documents.
- D. This section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 23. It expands and supplements the requirements specified in sections of Division 01.

#### 1.2 DEFINITIONS

- A. The term "Contractor" as applied to work specified, shown or reasonably implied in the contract documents for Division 23 shall be defined as the subcontractor who is responsible for the work specified or indicated. All subcontracted work must be incorporated by and coordinated by the prime contractor.
- B. Throughout this specification section the term "Design Professional" is referenced. The specification calls for certain actions to be undertaken or referred to the Design Professional. Accordingly, the term "Design Professional" shall be defined as the firm with which the "Owner" has contracted to produce the contract drawings and specifications. It shall be understood that the Design Professional for this project is the Architect whose name is shown on the drawing title block.

#### 1.3 MECHANICAL COORDINATION

- A. This Contractor shall familiarize himself with the work to be done under other Divisions of this specification and their related drawings and shall so coordinate and schedule his work as not to cause delays or interference with the work of others. Such coordination and scheduling shall accomplish the installation of equipment and piping with a minimum of cutting through masonry and other adjustments.
- B. Ceiling grid systems shall not be supported from ductwork, heating or plumbing lines or any other utility lines, and vice versa. Each utility and the ceiling grid system shall be a separate installation and each shall be independently supported from the building structure-concrete, steel or masonry. Where interferences occur, in order to support ductwork, piping, ceiling grid systems, etc., trapeze type hangers or supports shall be employed which shall be located so as not to interfere with access to such mechanical equipment as valves, regulators, VAV or reheat terminals, fire dampers, etc.

- C. This Contractor shall be responsible for proper size and location of anchors, chases, recesses, openings, etc., required for the proper installation of his work. Verify all dimensions by field measurements. Coordinate the installation of required supporting devices and sleeves in structural components as they are constructed. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work.
- D. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location. Install equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with a minimum of interference with other installations.
- E. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- F. Specific divisions of responsibility when coordinating with trades other than mechanical shall be as indicated on drawings, in Division 01, and as follows:
  - 1. The indicated Contractor under this division shall run the indicated utilities outside the building to points as noted on the drawings.
  - 2. Each Contractor under this division shall provide and place all sleeves in floors, walls, etc., and coordinate such location.
  - 3. Each Contractor under this division shall rough-in and connect all fixtures or equipment furnished by other trades or Owner where shown on the drawings.
  - 4. Each Contractor under this division shall provide motors, special controls, transformers and relays as required for the proper operation of all equipment furnished by him under this Division.
  - 5. The Contractors under this Division shall coordinate the location of floor drains and cleanouts with architectural and structural elements or work of other trades affecting the location of floor drains and cleanouts. Where floor drains are installed to serve specific pieces of equipment, coordinate the location of floor drains with the contractor who is providing the equipment, using manufacturer's shop drawings for the equipment served or written instructions from the equipment manufacturer.

## 1.4 EXAMINATION OF SITE

A. Before submitting a bid, each Contractor is requested to visit the job site to familiarize himself with construction conditions. No consideration or remuneration will be given for his failure to do so.

## 1.5 DIVISION 23 DESIGN DOCUMENTS

A. Should it appear that there is a discrepancy between or within the drawings and/or specifications concerning the nature, quality or extent of materials or work to be furnished and/or installed, and such discrepancy is not clarified by Addendum during the bidding period, this Contractor shall base his bid on performing the work in the manner having the higher cost. The Design Professional shall have the option of selecting either

of the manners shown and/or specified. In the event the lower cost manner is selected, a credit shall be due the Owner in the amount of the difference between the lower cost and higher cost manner. Any discrepancies shall be called to the attention of the Design Professional before proceeding with work affected thereby.

- B. Where a discrepancy exists within the specifications, among the drawings, or between the specifications and the drawings, refer to project supplementary conditions.
- C. Should it appear that there is a duplication on the drawings or in the specifications, wherein the same work or items are shown or specified as being provided under separate subcontracts or supply orders, and such duplication is not clarified by addendum during the bidding period, it shall be assumed that the responsible prime contractor will select and coordinate which subcontract will supply the item and the item will be supplied as indicated. Occasionally, certain references may be indicated on the Drawings to items which are suggested to be furnished and/or installed by various subcontractors. This is done to assist the applicable Prime Contractor in organizing his subcontractor's bids. However, no attempt has been made, nor is it implied, that this specification or plans are attempting to specifically divide all responsibilities for subcontractors. It is the Prime Contractor's responsibility that all items covered on mechanical plans and Division 23 specifications are included in his bid and are coordinated with his subcontractors. No consideration will be given for Prime Contractor's failure to include all applicable mechanical work in his bid.
- D. The design drawings, as submitted, are diagrammatic and are not intended to show exact location of equipment, piping and ductwork unless dimensions are given. Drawings are not to be scaled.
  - 1. Equipment shall be installed along the general arrangement indicated on the drawings, and in accordance with the manufacturer's instructions.
    - a. Provide at least the minimum manufacturer's recommended and code required clearance around the equipment for normal maintenance.
    - b. Locate and arrange equipment in relationship to other system components to assure that the equipment will be operating under the best possible conditions to meet the scheduled performance requirements.
  - 2. Piping and ductwork are to be installed along the general plans shown on the drawings keeping in mind the constraints of the available space and the need to coordinate with the work of other trades. Additional offset and fittings shall be provided as necessary to meet space constraints and to facilitate the work of other trades.
    - a. Recognizing the potential need for additional offsets and fittings in piping and ductwork, the Engineer has included a safety factor in all friction calculations. The Contractor is advised to plan and coordinate his work carefully to minimize the need for additional offsets and fittings. The Contractor shall be responsible to notify the Engineer of any and all modifications to systems which may affect the ability of equipment to serve its intended use prior to the purchase and installation of such equipment.
- E. All equipment, piping and material specified hereinafter as shown on the drawings shall be furnished and installed by this Contractor, unless specifically indicated to the contrary.

F. If this Contractor proposes to install equipment requiring space conditions other than those as specified and/or shown on the design drawings, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall obtain the full approval of the Design Professional before proceeding with the work.

# 1.6 RECORD/AS-BUILT DOCUMENTS

- A. Prepare record/as-built documents in accordance with the requirements of this division, and in Division 01.
- B. This Contractor shall record all changes from original design drawings which were made during the installation of the work. These changes shall be recorded in red ink on a designated set of prints. Changes shall be accurately dimensioned and/or drawn to scale.
- C. This Contractor shall keep an updated set of specifications and prints, including changes on the job site, at all times and shall submit one (1) set of updated and legible prints to the Design Professional when the work is complete. Additionally contractor shall update the 3-dimensional Revit model issued by the design team. The Design Professional shall issue the "Autodesk Revit" model to all contractors who will then be required to maintain and update it with all changes. All changes shall be bubbled (clouded) so they are easily recognizable. Bubbles shall be on a separate layer which can be turned off.

# 1.7 EQUIPMENT INSTALLATION DRAWINGS

A. Prepare and submit for approval coordination drawings drawn to readable scale of all areas where equipment or materials are being used which are not the basis of specification and result in a change in the accessibility, performance, or serviceability of such equipment, or a conflict with other trades. Such equipment or materials shall not be installed until the installation drawings have been reviewed by the A/E and other Contractors.

## 1.8 SHOP DRAWINGS

- A. Refer to the conditions of the Contract (General and Supplementary) and Division 01 Section: Shop drawings, product data, and samples for submittal definitions, requirements, and procedures.
- B. This Contractor shall review, stamp and sign with his approval and submit, with reasonable promptness and in orderly sequence so as to cause no delay in the work or in the work of any other Contractor, all submittal information required by the contract documents. Shop drawings not stamped with Contractor approval will be returned for reprocessing.
  - 1. In approving the submittals, the Contractor guarantees that the submittals accurately and completely represent the equipment and materials to be installed.
  - 2. Shop drawings shall be submitted for ALL material items as outlined in these specifications. Any deviations from contract requirements must be clearly indicated on shop drawings, and justification for their consideration must be included.

- 3. Acceptance of submittal items will not preclude rejection of those items upon later discovery that their suitability for the application or ability to meet the requirements of these specifications was misrepresented in the submittals.
- 4. Submittals for equipment shall include detailed dimensional drawings which completely and accurately represent the specific piece of equipment to be supplied. When more than one piece of similar equipment is to be supplied, provide accurate dimensional drawings for each unique size and/or configuration of the equipment.
- C. In checking shop drawings, the Design Professional will make every effort to detect and correct errors, omissions and inaccuracies in such drawings, but his failure to detect errors, omissions and inaccuracies shall not relieve the Contractor of responsibility for the proper and complete installation in accordance with the intent of the Contract Documents.

## 1.9 EQUIPMENT

- A. Before entering into a contract, the successful bidder may be required to submit satisfactory evidence to show that the manufacturer of all parts of the equipment offered have been regularly engaged in the manufacture of such equipment for three (3) years and have not less than three (3) installations of a similar type which have been in successful operation under conditions similar to those specified for not less than two (2) years.
- B. When two or more items of same equipment are required (plumbing fixtures, pumps, valves, etc.) they shall be of the same manufacturer.

## 1.10 SUBSTITUTIONS

- A. Refer to the Instructions to Bidders and the related Division 01 sections for requirements in selecting products and requesting substitutions.
- B. Bids concerning the use of substitute products must be accompanied by complete specifications and performance characteristics covering these products, together with such available test data and experience records as may be helpful to the Design Professional in evaluating the quality and/or suitability of the proposed products.

## 1.11 SUPERVISION

A. The Contractor shall have in charge of work at all times during construction a competent foreman or superintendent whose experience and background shall qualify him for the work to be performed under this division. Once assigned, the foreman or superintendent shall be retained until completion of the project and any consideration as to his removal on grounds of incompetence shall either be initiated by or referred to the Design Professional for decision.

## 1.12 CODES AND PERMITS

- A. All equipment, materials, and installation shall comply with the National Fire Protection Association's "National Fire Codes" and "National Electrical Code". Equipment shall bear the "UL" label as required by these codes.
- B. Install work in full accordance with rules and regulations of State, County and City authorities having jurisdiction over premises. This shall include safety requirements of 2009 IBC Mechanical and Plumbing Code. Do not construe this as relieving Contractor from compliance with any requirements of specifications which are in excess of Code requirements and not in conflict therewith. Sanitary waste and vent piping indicated may, in some instances, exceed code requirements. If drawings indicate individual wastes for each fixture, the drawings shall hold precedent over the Code as long as pipe sizing equals or exceeds prescribed waste and vent Code minimums.
- C. Unless otherwise indicated, secure and pay for all permits and certificates of inspection incidental to this work required by foregoing authorities. Be responsible for payments to all public utilities for work performed by them in connection with provision of service connections required under this DIVISION of specifications. Deliver all certificates to Design Professional in duplicate.

## 1.13 INTERFERENCES

- A. Before installing any work, this Contractor shall see that it does not interfere with clearance required for finish on beams, columns, pilasters, walls or other structural or architectural members, as shown on Architectural Drawings. If any work is so installed and it later develops that Architectural design cannot be followed, Contractor shall, at his own expense, make such changes in his work as the Design Professional may direct to permit completion of Architectural work in accordance with plans and specifications.
- B. Install additional offsets on piping or ductwork where required to obtain maximum headroom or to avoid conflict with other work without additional cost to the Owner. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- C. Report any interferences between work under this division and that of any other Contractors to the Design Professional as soon as they are discovered. The Design Professional will determine which equipment shall be relocated, regardless of which was first installed, and his decision shall be final.

## 1.14 SHOP AREAS AND MATERIAL STORAGE

- A. No mechanical related trade is permitted to use as shop working area, any area, except by express permission of the Design Professional.
- B. The Contractor shall make provisions for the delivery and safe storage of his materials and equipment in coordination with the work of others. Materials and equipment shall be delivered at such stages of the work as will expedite the work as a whole and shall be marked and stored in such a way as to be easily checked and inspected. The arrival and placing of large equipment items shall be scheduled early enough to permit entry and setting when there is no restriction or problem due to size and weight.

### 1.15 CLEAN-UP

- A. Refer to the Division 01 for general requirements for project cleaning.
- B. Insofar as the Mechanical work is concerned, at all times keep premises and building in neat and orderly condition, follow explicitly any instructions of Design Professional in regard to storing of materials, protective measures, cleaning-up of debris, etc.
- C. Upon completion of work this Contractor shall thoroughly clean all apparatus furnished by him, pack all valves and thoroughly clean piping, ductwork, fixtures, and equipment removing all dirt, grease and oil.
- D. Air systems shall not be operated without filters. Upon completion of work replace all filters.

#### 1.16 OPERATING AND MAINTENANCE

- A. This Contractor shall furnish competent personal instruction to the Owner's operating personnel for a period of hours as indicated in individual Division 23 specification sections in the proper operation of the mechanical equipment. He shall also supply the Owner with three (3) hardbound copies of an operation manual containing the following:
  - 1. Step-by-step procedures for start-up and shutdown for each system and piece of equipment.
  - 2. Performance data, curves, ratings.
  - 3. Wiring diagrams.
  - 4. Manufacturer's descriptive literature.
  - 5. Automatic controls with diagrams and written sequence of operation.
  - 6. Manufacturer's maintenance and service manuals.
  - 7. Plumbing fixtures.
  - 8. Spare parts and replacement parts list for each piece of equipment.
  - 9. Name of service agency and installer complete with an emergency service phone number for nights, weekends and holidays.
  - 10. Final approved shop drawings.
  - 11. Final approved balance reports.

#### 1.17 WARRANTIES

- A. Refer to the Division 01 Section: Specific Warranties for procedures and submittal requirements for warranties. Refer to individual equipment specifications for additional warranty requirements.
- B. This Contractor shall warranty all materials, workmanship and the successful operation of all equipment and apparatus installed by him for a period of one year from the date of the final acceptance of the entire work and shall guarantee to repair or replace at his own expense any part of the apparatus which may show defect during that time provided such defect is, in the opinion of the Design Professional, due to imperfect material or workmanship and not to carelessness or improper use. Compile and assemble the warranties specified in Division 23 into a separated set of vinyl covered three-ring binders, tabulated and indexed for easy reference.

## 1.18 TEMPORARY SERVICES

- A. The Contractor under this division shall provide temporary services, i.e.: heat, cooling, ventilation, water, fuel, sanitary, or storm as specified herein or in Division 01 "General Conditions" and "Special Conditions" portions of this specification.
- B. Permanent equipment may be used for temporary (construction period) services only as directed by the Design Professional. Any permanent equipment used, shall be maintained by this Contractor. Owner's warrantee period shall not begin until final acceptance of the completed system.
- C. Permanent air handling units may be used during the construction period for heating or "drying-out" the building, however, unit shall operate in 100% outside air mode, with filters installed at all return air grilles and registers in the building. Air handling filters shall be provided by the contractor and shall not count toward the initial or spare filter sets provided at project completion. Prior to utilizing air handling units in such a manner, the air handling unit manufacturer shall perform startup inspections to prevent damage to the equipment.

## 1.19 PROTECTION OF WORK AND PROPERTY

- A. The Contractor shall be responsible for safeguarding work, property and facilities against damage, both his own as well as others, with which he may come into contact in the performance of his work.
- B. Stored materials shall be protected against damage from weather. Pipe and duct openings shall be closed with caps or plugs during installation. All fixtures and equipment shall be covered and protected against injury. Any materials or equipment damaged at any stage in the construction shall be replaced or repaired, and at the final completion of all work shall be in a clean, unblemished condition.

## 1.20 CUTTING AND PATCHING

- A. Refer to the Division 01 for general requirements for cutting and patching.
- B. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- C. Each contractor under this division shall perform cutting, fitting, and patching of building components and mechanical equipment and materials required to:
  - 1. Uncover Work to provide for installation of ill-timed Work;
  - 2. Remove and replace defective Work;

- 3. Remove and replace Work not conforming to requirements of the Contract Documents;
- 4. Remove samples of installed Work as specified for testing;
- 5. Install equipment and materials in existing structures;
- 6. Upon written instructions from the Design Professional, uncover and restore Work to provide for Design Professional observation of concealed Work.
- D. See other sections of this specification for demolition requirements.
- E. Pipe holes in floors and walls shall be core drilled if not sleeved during construction.
- 1.21 INTERRUPTION OF SERVICE
  - A. When work progress makes temporary shutdown of services unavoidable, shutdown shall be coordinated with and approved by Owner so as to cause minimum disruption to established operating routine. Arrange to work as necessary to re-establish service within shortest possible down time. In those instances where the length of time required for the service interruption is not acceptable to the Owner, unless otherwise indicated, furnish and install temporary connections as required to reduce the length of time of service interruption to an acceptable level.

PART 2 - PRODUCTS (Not Applicable to this Section)

# PART 3 - EXECUTION

## 3.1 TESTS AND ADJUSTMENTS:

- A. Upon completion of the erection of all equipment and all work specified herein and/or shown on approved drawings, or at such times as directed by the Design Professional, this Contractor shall start all apparatus, make necessary tests as directed and as specified herein and make complete adjustments of all items of equipment before acceptance by the Design Professional to whose representative this Contractor shall demonstrate (by performance) all of the various apparatus and equipment.
- B. This Contractor is referred to Section 230593 "Testing, Adjusting, and Balancing" for additional information and requirements. Cooperate fully with the AABC Balancing Contractor to achieve a successful balance. Any and all adjustments to equipment including fan sheave replacement shall be the responsibility of this Contractor. Required adjustments shall be made during the course of the balancing procedure; the final balance report must reflect the best possible performance of the systems.
- C. When the Contractor is ready to run capacity tests, he shall notify the Design Professional. When this notice is given, the Design Professional will assume that the Contractor has made preliminary tests and is satisfied that the plant will develop specified and guaranteed capacities. It will be the Contractor's responsibility to furnish any and all instruments required to obtain test data which shall include thermometers, electric meters, pressure gages, etc.

- D. Work under this division of the specifications shall not be considered complete until the Contractor has obtained required inspection, performance tests, made necessary adjustments and has submitted satisfactory evidence of compliance. The Design Professional or his representative will make spot checks to determine the accuracy and completeness of final adjustments. Should spot checks indicate more than a reasonable deviation from design requirements, the Contractor shall repeat tests and adjustments to the satisfaction of the Design Professional.
- E. After or during one complete heating and cooling season, the HVAC Contractor shall make any minor adjustments that may be necessary to ensure uniform temperatures throughout the spaces.
- F. During the testing and balancing period, this Contractor shall maintain on the job a competent individual thoroughly familiar with all phases of air conditioning, including refrigeration, temperature control, air and water distribution, for as long a period as may be required to thoroughly adjust all of the systems and to demonstrate to the Design Professional that they are functioning properly.

## 3.2 PUNCHLISTS

A. From time to time throughout the course of the work, or upon completion of the work the Design Professional may perform site observations resulting in written documentation of deviations in the work from the Contract Documents. In such cases the Contractor shall respond in writing to each and every item on this written documentation stating the specific action taken to remedy the deviation. A response shall be provided by the Contractor for each separate observation. This work shall not be considered complete until such satisfactory written response is received by the Design Professional.

END OF SECTION 230500

# SECTION 230505 – COMMON HVAC MATERIALS AND METHODS

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.
- B. Requirements specified in Division 23 Section Common Work Results for HVAC" apply to this section.
- C. Requirements of Division 02 specification sections apply to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of mechanical related work required by this section is indicated on drawings and/or specified in other Division 23 sections.
- B. Except as noted in this specification, this Contractor shall do all excavating and backfilling necessary to the work of this Division.
- C. This Contractor is to coordinate all excavating and backfilling required under this Division with General Trades as specified under Division 02.
- D. See specification Division 09 for painting requirements. Coordinate all mechanical painting work required. Coordinate protection requirements for mechanical equipment which could be damaged by paint.
- E. Furnish and install all miscellaneous steel required for supports, hangers, anchors, guides, etc., required for installation of equipment and materials furnished and installed under this Division. Steel used in a moist environment shall be hot dipped galvanized unless otherwise noted.
- F. This Contractor shall provide to the General Trades Contractor dimensions and special requirements for the concrete foundations or bases under all equipment that rests on floors in Mechanical Equipment Rooms. Follow drawings and/or manufacturer's literature with regard to design and construction of same.
- G. Furnish and install sound stopping around penetrations or mechanical materials and equipment.
- H. Furnish and install fire and smoke penetration seals around penetrations of mechanical materials and equipment through fire or smoke barriers, floors and foundation walls.

#### 1.3 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Concrete Work Codes and Standards: Comply with governing regulations and, where not otherwise indicated, comply with industry standard, in its application to work in each instance.

## 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including the recommended installation method, all in accordance with Division 01 and Section 230500 requirements.
- B. Mechanical System Penetration Seals: Submit the following:
  - 1. Shop drawings showing each condition requiring penetration seals in dictating proposed UL systems materials, anchorage, methods of installation, and actual adjacent construction.
  - 2. A copy of UL illustration of each proposed system indicating manufacturer approved modifications.
  - 3. Manufacturer's specifications, recommendations, installation instructions and maintenance instructions.

## PART 2 - PRODUCTS

#### 2.1 MATERIALS OF DIVISION 23 CONCRETE WORK

- A. Reinforcing Materials:
  - 1. Reinforcing Bars: Except as otherwise indicated, provide ASTM A 615, deformed, Grade 40 for size numbers 3 through 18; ASTM A 675, plain, Grade 60, for size number 2; sizes as indicated or required.
- B. Reinforcement Supports: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Provide wire bar type supports complying with CRSI recommendations, unless otherwise indicated.
- C. Concrete Materials:
  - 1. Portland Cement: ASTM C 150, Type I, except as otherwise indicated.
  - 2. Aggregates: ASTM C 33, except as otherwise indicated.
    - a. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used.
    - b. For rough grouting, provide aggregate which is well graded and 100 percent passing through 3/8" sieve.
  - 3. Water: Clean and free of substances harmful to concrete.

### 2.2 DESIGN AND PROPORTIONING OF CONCRETE MIXES

- A. General: Design mechanical work concrete as follows, for each 28-day compressive strength class:
  - 1. 4000 psi Class: 565 lbs. of cement per cu. yd. (6.0 sacks), and 0.35 water/cement ratio.
  - 2. 3000 psi Class: 500 lbs of cement per cu. yd. (5.25 sacks), and 0.46 water/cement ratio.
  - 3. 2500 psi Class: 450 lbs. of cement per cu. yd. (4.75 sacks), and 0.54 water/cement ratio.
  - 4. Backfill Class (Lean Concrete): 375 lbs of cement per cu. yd., (4.0 sacks), and 0.60 water/cement ratio.
  - 5. Rough Grouting Class: 565 lbs. of cement per cu. yd. (6.0 sacks), and 0.60 water/cement ratio.
- B. Mix for Patching: Where mechanical work requires patching of exposed concrete work which has been cut to accommodate mechanical work, provide concrete patching mix which is identical with mix of work being patched (same cement, aggregates, admixtures and proportioning).

# PART 3 - EXECUTION

# 3.1 INSTALLATION OF CONCRETE WORK

- A. Miscellaneous Concrete Work:
  - 1. Concrete Grouting: Space approximately 1" thick between bottom of equipment and top of concrete foundation or base which remains after shimming, shall be filled completely with grouting. Grout shall be made up with sand and cement designed for the purpose which does not shrink on setting up. Exposed surface of grouting shall be finished to make a neat appearance. Grout openings and recesses as indicated, in and around mechanical work and other work which penetrates or adjoins mechanical concrete work, using rough grouting class of concrete mix. Provide formwork where required, and tamp, screed and trowel surfaces. Cure grout as specified for concrete work.
  - 2. Concrete Bases: In the absence of more specific information, either on drawings, or manufacturer's literature, the bases shall be level, shall have a minimum height above finished floor of 4" and extend 3" beyond the skids, feet or bed plate of the item of equipment.
  - 3. Concrete pads, beams, pedestals, or saddles placed in existing structures shall be mounted securely to the original substrate with anchor bolts.
- B. General Concrete Clean-Up: Upon completion of concrete work, clean excess concrete from adjacent areas and surfaces. Remove excess concrete by proper methods of washing or scraping, using care not to scratch or otherwise damage finished surfaces.

#### 3.2 MECHANICAL SYSTEM SOUND STOPPING

- A. Where pipes or ducts or other components of Division 23 work pass through non-fire rated walls or floors, but walls which extend from horizontal structure to structure, provide sound stopping between such mechanical work and the building structure intended to reduce the transmission of sound from one side of the wall to the other.
- B. Sound stopping of pipes in sleeves shall consist of sealing the outside of the sleeve with caulking and the inside with an insulating material.
  - 1. See Section 230550 for pipe sleeve requirements.
- C. Sound stopping of pipes or ducts without sleeves shall consist of packing the cavity around the penetration with an insulating material and sealing the opening with approved sealant or plaster.
- D. Insulating materials shall be non-asbestos and non-friable, and shall have a flame spread rating of no more than 25 and a smoke developed rating of no more than 50.

#### 3.3 MECHANICAL SYSTEM PENETRATION SEALS

- A. Where pipes or ducts or other components of Division 23 work pass through fire or smoke rated walls or floors, provide non-asbestos seal assemblies classified by UL to provide fire barriers equal to the time rating of the construction being penetrated, with materials that comply with applicable codes and that have been tested in accordance with UL 1479 or ASTM E-814.
- B. Install penetration seal materials in accordance with printed instructions of the UL Building Materials Directory and in accordance with manufacturer's instructions. Seal all holes or voids made by penetrations. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.

END OF SECTION 230505

## SECTION 230513 – COMMON ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

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.
- B. Related Sections: Separate electrical components and materials required for field installation and electrical connections are specified in Division 26.

#### 1.2 SUMMARY

- A. This section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.
- B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are scheduled on the Drawings, and further described in other specification sections.

#### 1.3 SUBMITTALS

- A. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections. Submit compliance to referenced standards and efficiencies.
- B. Free standing motors, starters, and other electrical components not submitted under other sections shall require separate submittal.
- C. Submit manufacturer's electrical requirements for power supply wiring. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

#### 1.4 QUALITY ASSURANCE

- A. National Electrical Manufacturer's Association (NEMA) Standards MG 1: Motors and Generators, "Energy Efficient Design".
- B. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.
- C. NEMA Standard 250: Enclosures for Electrical Equipment
- D. NEMA Standard KS 1: Enclosed Switches

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E. Comply with National Electrical Code (NFPA 70). Provide motors specified in this section that are "Listed and Labeled" as defined in Article 100.

# PART 2 - PRODUCTS

#### 2.1 MOTORS:

- A. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
  - 1. Motors ½ HP and Larger: Polyphase.
  - 2. Motors Smaller than  $\frac{1}{2}$  HP: Single phase.
  - 3. Frequency Rating: 60 Hz.
  - 4. Voltage Rating: Determined by voltage of circuit to which motor is connected.
  - 5. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
  - 6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
  - 7. Temperature Rise: Match insulation rating, unless otherwise indicated.
  - 8. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence and without exceeding nameplate ratings or considering service factor.
  - 9. Enclosure Type: Shall be open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, guarded drip-proof motors where exposed to contact by employees or building occupants, and weather protected Type I for outdoor use, Type II where not housed.
  - 10. Overload Protection: Built-in thermal overload protection rated at 115% of full load motor and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
  - 11. Noise Rating: Provide "Quiet" rating on motors located in or near occupied spaces of building.
  - 12. Efficiency: Motors shall have a minimum efficiency as scheduled in accordance with NEMA Standard MG-1, most current table for high efficiency motors. Motors must meet or exceed the guaranteed minimum of this standard and shall be nameplated with the nominal value.
- B. Polyphase Motors:
  - 1. Description: NEMA MG 1, medium induction motor.
    - a. Design Characteristics: NEMA MG 1, Design B, unless otherwise indicated.
    - b. Energy-Efficient Design: Where indicated.
    - c. Stator: Copper windings, unless otherwise indicated. Multispeed motors have separate winding for each speed.
    - d. Rotor: Squirrel cage, unless otherwise indicated.
    - e. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.

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- f. Temperature Rise: Match insulation rating, unless otherwise indicated.
- g. Insulation: Class F, unless otherwise indicated.
- 2. Inverter Duty Motors Used with Variable-Frequency Drives: Ratings, characteristics, and features coordinated with and approved by drive manufacturer.
  - a. Critical vibration frequencies are not within operating range of drive output. Comply with NEMA MG1-1993, Part 31.40.4.2.
  - b. Temperature Rise: Match rating for Class B insulation.
  - c. Insulation: Class H
- 3. Rugged-Duty Motors: Where indicated, motors are totally enclosed with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings are insulated with nonhygroscopic material. External finish is chemical-resistant paint over corrosion-resistant primer.
- 4. Source Quality Control: Perform the following routine tests according to NEMA MG 1:
  - a. Measurement of winding resistance.
  - b. No-load readings of current and speed at rated voltage and frequency.
  - c. Locked rotor current at rated frequency.
  - d. High-potential test.
  - e. Alignment.
- C. Single-Phase Motors:
  - 1. Type: As indicated in equipment specification sections, or if not indicated as selected by manufacturer from one of the following, to suit starting torque and other requirements of specific motor application.
    - a. Permanent-split capacitor.
    - b. Split-phase start, capacitor run.
    - c. Capacitor start, capacitor run.
  - 2. Shaded-Pole Motors: Do not use, unless motors are smaller than 1/20 hp.
  - 3. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
  - 4. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve bearings for other single-phase motors.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering motors that may be incorporated into the work include, the following:

Baldor General Electric

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## PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 HP and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts. Align pulleys and shafts and set tension as applicable according to manufacturer's written instructions.
- B. Install power and control connections for motors to comply with NEC and applicable provisions of Division 26 sections. Install grounding except where non-grounded isolation of motor is indicated.

END OF SECTION 230513

# SECTION 230529 - HANGERS, SUPPORTS AND ANCHORS

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.
- B. Division 23 Common Work Results for HVAC and Common HVAC Materials and Methods sections apply to work specified in this section.
- C. See also Section 230548 "Vibration Control" for spring hanger requirements.

## 1.2. DESCRIPTION OF WORK

- A. Extent of supports and anchors required by this section is indicated on drawings and/or specified in other Division 23 sections.
- B. Types of supports and anchors specified in this section include the following:

Horizontal - Piping Hangers and Supports. Vertical - Piping Clamps. Hanger - Rod Attachments. Building Attachments. Saddles and Shields. Miscellaneous Materials. Roof Equipment Supports. Anchors. Equipment Supports

C. Supports and anchors furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 23 sections.

## 1.3. QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of type and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
  - 1. Code Compliance: Unless requirements are exceeded herein, comply with applicable codes pertaining to product materials and installation of supports and anchors.
  - 2. Comply with NFPA 13 for hangers and supports used as components of fire protection systems. Include listing and labeling by UL and FM.
  - 3. Factory fabricate hangers, supports, and components according to MSS SP-58.

#### 1.4. SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support. For equipment curbs supply manufacturer's certified load bearing data. Submit pipe hanger and support schedule showing manufacturer's figure number, size, location, and features for each required pipe hanger and support.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support, indicating dimensions, weights, required clearances, and methods of assembly of components.

# PART 2 - PRODUCTS

## 2.1. HORIZONTAL - PIPING HANGERS AND SUPPORTS:

A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type of one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems. Provide felt lined hangers or clamps for uninsulated refrigerant piping to eliminate transmission of sound and vibration. Perforated strap hangers shall not be used in any work.

## 2.2. VERTICAL-PIPING CLAMPS

A. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with MSS SSP-58, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

#### 2.3. HANGER-ROD ATTACHMENT

A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

# 2.4. BUILDING ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, expansion shells, inserts or beam clamps selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. All beam clamps shall be installed with a retaining strap to grasp two opposing sides of structure to prevent possible movement of the clamp due to vibration. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems. "C" clamps shall not be permitted except on fire protection piping.

# 2.5. MANUFACTURERS OF HANGERS AND SUPPORTS

A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:

B-Line Systems, Inc. Globe Hanger ITT Grinnell Corp. Michigan Hanger Modern Hanger PHD Manufacturing, Inc.

## 2.6. SADDLES AND SHIELDS

- A. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation. See PART 3 for application.
- B. Saddles: Install MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation. Utilize hardwood block saddle (minimum 6" long), with sufficient width to prevent hanger bearing on insulation for chilled water piping saddles.
- C. Shields: Install MSS Type 40, protective shields. Shields shall span an arc of 180 degrees, and have a length of 12 inches, thickness of 0.048 inches for piping under 4 inches diameter; length of 12 inches, thickness of 0.060 inches for piping 4 inches diameter; and length of 18 inches, thickness of 0.060 inches for piping 5 and 6 inches in diameter.
- D. Thermal Hanger Shield Inserts:
  - 1. Constructed of 360 deg insert of high density, 100 psi, water-proofed calcium silicate, encased in 360 deg sheet metal shield. Provide assembly of same thickness as adjoining insulation, with sufficient width to prevent hanger bearing on insulation.

# 2.7. MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.
- C. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards. Material coatings for interior use shall be electro-plated zinc (ASTM B633), or mill galvanized (ASTM A525 G90). For exterior use, materials shall be hot-dip galvanized after fabrication (ASTM A386).
- D. Bolts and Nuts: ASME B18.10 or ASTM A183, steel, hex-head, track bolts and nuts. Use galvanized or stainless steel for use in moist environments.

#### 2.8. ROOF EQUIPMENT SUPPORTS

- A. Refer to the drawings, schedules and applicable specification sections for roof equipment supports indicated to be furnished by the unit manufacturer.
- B. Fabricated Roof Equipment Supports:
  - 1. General: Construct roof equipment supports using minimum 18-ga galvanized steel with fully mitered and welded corners, 3" cant, internal bulkhead reinforcing, integral base plates, pressure treated wood nailer, and 18-ga galvanized steel counterflashing.
  - 2. Configuration: Construct of sizes as indicated, compensate for slope in roof so top of support is dead level.
  - 3. Pipe Boots: Provide boots for piping, power conduit and control conduit as required by pipe curb manufacturer. Boot to be expandable, designed to accommodate the pipe or conduit size utilized, and capable of maintaining a weather-tight seal even with minor vibration in piping.
  - 4. Manufacturer: Subject to compliance with requirements, provide roof equipment supports of one of the following:

Custom Curb Pate Co. Roof Products and Systems (RPS) Thycurb Div.; Thybar Corp.

# PART 3 - EXECUTION

- 3.1. INSPECTION
  - A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
#### 3.2. PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

## 3.3. INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated below. Install additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. For new concrete, install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.
- B. Two or one-end threaded rod sizing for various support loads shall be as follows:

ROD DIAMETER	MAXIMUM LOAD (LBS.)
3/8"	610
1/2"	1130
5/8"	1810
3/4"	2710
7/8"	3770
1"	4960
1-1/8"	6230

Note limitations on structure supporting rods.

C. For reference purposes, the following table provides filled weights of steel piping for various sizes:

PIPE SIZE	FILLED PIPE WEIGHT (LB/FT)
1/2"	1.0
3/4"	1.4
1"	2.1
1-1/4"	3.0
1-1/2"	3.6
2"	5.1
2-1/2"	7.9
3"	10.8
4"	16.3
6"	31.5
8"	50.2
10"	74.6
12"	98.6

- D. Unless hanger spacing is
  - 1. Specifically indicated on drawings
  - 2. Indicated in other Division 23 specification sections for special applications
  - 3. Required to be more frequently by State or local codes
    - All piping shall be supported at distances not exceeding the spacing in the following table. This table is intended for general distribution piping. Within equipment rooms, hangers must be arranged to provide full support of piping. No piping is to be supported by, or impose a load upon the equipment to which it is connected.

HANGER SPACING TABLE		
PIPING MATERIAL	MAX. HORIZONTAL SPACING (FEET) <sup>4</sup>	MAX. VERTICAL SPACING (FEET) <sup>4</sup>
ABS Pipe	4	4
Aluminum Tubing	10	15
Brass Pipe	10	10
Brass Tubing, 1-1/4" Dia. & Smaller	6	10
Brass Tubing, 1-1/2" Dia. & Larger	10	10
Cast-Iron Pipe <sup>1</sup>	5	15
Copper or Copper-Alloy Pipe	12	10
Copper or Copper-Alloy Tubing, 1- 1/4" Dia. & Smaller	6	10
Copper or Copper-Alloy Tubing, 1- 1/2" Dia. & Larger	10	10
CPVC Pipe or Tubing, 1" Dia. & Smaller	3	4 <sup>2</sup>
CPVC Pipe or Tubing, 1-1/4" Dia. & Larger	4	4
Galvanized Steel Pipe	12	15
Lead Pipe	Continuous	4
PB Pipe or Tubing	2.67 (32")	4
PVC Pipe	4	4
Steel Pipe	12	15
Steel Tubing	8	10
Gas Piping <sup>3</sup>		
Rigid Pipe, 3/4" Dia. and Under	10	
Rigid Pipe, 1" Dia. & Over	12	
Tubing, 1-1/2" Dia. & Under	6	
Tubing, 1-1/2" Dia. & Over	10	
Footnotes:		

1. The maximum horizontal spacing of cast-iron pipe hangers shall be increased to 10 feet where 10-foot lengths of pipe are installed.

2. Install mid-story guide.

 Gas piping horizontal maximum hanger spacing shall be the lesser of that indicated for the specific material utilized or that indicated for gas piping. Maximum vertical spacing shall be that indicated for the material utilized.

4. 1 foot = 304.8 mm.

## 3.4. INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washer and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Support fire protection piping independently of other piping.
- D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- E. Provisions for Movement:
  - 1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- F. Pipe Slopes: Install hangers and supports to provide indicated or specified pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
- G. Horizontal Piping: Comply with the following installation requirements.
  - 1. Individual hangers for uninsulated piping not specified to be supported with roller hangers may be supported with either adjustable band hangers or adjustable steel clevis hangers.
  - 2. Individual hangers for insulated piping not specified to be supported with roller hangers shall be adjustable steel clevis hangers.
  - 3. Support the following horizontal piping using adjustable roller hanger supports MSS Type 43 for twelve (12) inches and below and MSS Type 41 for fourteen (14) inches and above:
    - a. All piping 4 inches in size and above, regardless of medium.
  - 4. Heavy duty trapezes may be utilized for multiple horizontal pipes where applicable. Design of same shall be by trapeze manufacturer considering weight, available structure, pipe medium, material, etc. Supports for individual piping group on trapezes shall be as specified for individual piping.
- H. Insulated Piping: Comply with the following installation requirements.

- 1. Clamps: At contractor's option to shields, where flexible elastomeric insulation is indicated on piping size two (2) inches and under, attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
- 2. Saddles: Where piping is insulated and piping is eight (8) inches in diameter or larger, or piping of any size on roller hanger supports, install protection saddles. Fill interior voids with segments of insulation matching adjoining insulation.
- 3. Shields: Where insulation is indicated on piping, install galvanized protective shields for sizes 6" and smaller. Install thermal hanger shield inserts with same thickness as pipe insulation.

# 3.5. INSTALLATION OF ANCHORS

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

## 3.6. EQUIPMENT SUPPORTS

- A. Provide painted structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.
- B. Provide grout under supports as required to bring piping and equipment to proper level and elevations.

## 3.7. ROOF EQUIPMENT SUPPORTS

- A. Furnish roof equipment supports to Contractor for installation as part of work of Division 7; not work of this section.
- B. Install roof equipment supports in compliance with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, vapor barriers, roof insulation, roofing and flashing as required to ensure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and

outward loading pressures. Meet all requirements necessary to maintain the roofing manufacturer's warranty as applicable.

### 3.8. ADJUSTING AND CLEANING

- A. Hanger Adjustments: Adjust hangers so as to distribute loads equally on attachments and to achieve slope of pipe.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 230529

## SECTION 230548 - VIBRATION CONTROL

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.
- B. Division 23 Common Work Results for HVAC and Common HVAC Materials and Methods sections apply to work specified in this section.
- 1.2. DESCRIPTION OF WORK
  - A. Extent of vibration control work required by this section is indicated on drawings and schedules, and/or specified in other Division 23 sections.
  - B. Types of vibration control products specified in this section include the following:

Fiberglass Pads and Shapes. Neoprene Pads. Vibration Isolation Springs. Spring Isolators, Housed. Spring Isolators, Vertically-Restrained. Equipment Rails. Inertia Base Frames. Isolation Hangers. Riser Isolators. Flexible Pipe Connectors.

- C. Vibration control products furnished as integral part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 23 sections.
- D. Refer to other Division 23 sections for equipment foundations, hangers, sealants, gaskets, and other work related to vibration control work.
- E. Refer to other Division 23 sections for requirements of electrical connections to equipment isolated on vibration control products.
- F. Refer to other Division 23 sections for requirements of duct connections to air handling equipment isolated on vibration control products.

## 1.3. QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control products, of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 3 years.
  - 1. Except as otherwise indicated, obtain vibration control products from single manufacturer.

2. Engage manufacturer to provide technical supervision of installation of vibration control products.

#### 1.4. SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of vibration control product. Submit schedule showing size, type, deflection, and location for each product furnished.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weights, required clearances, and method of assembly of components. Detail bases, and show location of equipment anchoring points, coordinated with equipment manufacturer's shop drawings.
- C. Maintenance Data: Submit maintenance data for each type of vibration control product. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Divisions 01 and 23.

### PART 2.-PRODUCTS

- 2.1. ACCEPTABLE MANUFACTURERS
  - A. Manufacturer: Subject to compliance with requirements, provide vibration control products of one of the following:
    - 1. Vibration Isolators:

Consolidated Kinetics Corp. Korfund Dynamics Corp. Mason Industries, Inc. Peabody Noise Control, Inc. Vibration Eliminator Co., Inc.

- B. Manufacturer: Subject to compliance with requirements, provide flexible pipe connectors of one of the following:
  - 1. Flexible Pipe Connectors:

Flexonics, Inc. Keflex, Inc. Metraflex Co.

- C. Manufacturer: Subject to compliance with requirements, provide roof-curb isolators of one of the following:
  - 1. Roof Curb Isolators:

Mason Industries, Inc. Pate Co. Thycurbs Div.; Thybar Corp.

VIBRATION CONTROL

## 2.2. VIBRATION CONTROL MATERIALS AND SUPPORT UNITS

- A. Fiberglass Pads and Shapes: Glass fiber of not more than 0.18 mil diameter, produced by multiple-flame attenuation process, molded with manufacturer's standard fillers and binders through 10 compression cycles at 3 times rated load bearing capacity, to achieve natural frequency of not more than 12 Hertz, in thicknesses and shapes required for use in vibration isolation units.
- B. Neoprene Pads: Oil-resistant neoprene sheets, of manufacturer's standard hardness and cross-ribbed or waffled pattern.
- C. Vibration Isolation Springs: Wound-steel compression springs, of high-strength spring alloy steel; with spring diameter not less than 0.8 of compressed height of spring at rated loads. Provide minimum additional travel to solid, equal to 50% of rated deflection. Provide spring wire with elastic limit stress exceeding stress at solid deflection.
- D. Spring Isolators, Housed: Except as otherwise indicated, provide vibration isolation spring between telescoping steel housings with top and bottom loading plates, and with pad-type isolator bonded to bottom of loading plate. Include resilient inserts to separate and guide telescoping housings.
  - 1. Equip top loading plate with equipment anchorages as indicated or as required for support and attachment.
  - 2. Include pad-type isolator bonded to top of top loading plate, except on units with leveling bolts.
  - 3. Include holes in bottom plate for bolting unit to substrate.
- E. Spring Isolators, Vertically-Restrained: Provide spring isolators in housing that includes vertical limit stops. Design housing to act as blocking during erection, and with installed height and operating height being equal. Maintain 1/2 inch minimum clearance around restraining bolts, and between housing and springs. Design so limit stops are out of contact during normal operation.
- F. Equipment Rails: Where rails or beams are indicated for use with isolator units to support equipment, provide steel beams complying with ASTM A36, with minimum depth of 6 inches or 0.10 x span of beam between isolators (whichever is greater). Provide welded bracket at each end of beams, and anchor each end to spring isolator unit. Provide bolt holes in beams matching anchor bolt holes in equipment. Provide beams of section modulus indicated or, if not indicated, selected for normal-weight equipment loading to limit static load stress to 16,000 psi.
- G. Isolation Hangers: Hanger units formed with brackets and including manufacturer's standard compression isolators of type indicated. Design brackets for 3 times rated loading of units. Fabricate units to accept misalignment of 15 deg off center in any direction before contacting hanger box, and for use with either rod or strap type members, and including acoustical washers to prevent metal-to-metal contacts.
  - 1. Provide vibration isolation spring with cap in lower part of hanger and neoprene hanger element in top, securely retained in unit.
  - 2. Provide hangers, precompressed to rated load to limit deflection during installation. Design so hanger may be released after full load is applied.

- H. Riser Isolators: Suspend risers from, or support risers by, spring hangers or spring isolators. Wherever possible, anchor risers at central point with resilient anchors. Provide hanger or mounting deflection of 0.75 inch except in those expansion locations where additional deflection is required to limit deflection or load changes to +/-25% of initial deflection. Provide sliding guides held in position by resilient anchors, located between anchor points and end of piping, spaced as indicated.
- I. Flexible Pipe Connectors:
  - 1. For non-ferrous piping, provide bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.
  - 2. For ferrous piping, provide stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose.
- J. Flexible Pipe Connectors: At pumps provide type 304 stainless steel corrugated bellows with control rods and 150 psig ANSI steel flanges. Expansion element shall be joined to flanges by flaring over face or by welding to the flange bore. The entire unit shall be rated for 150 psig working pressure at 800 deg F working temperature.

### PART 3.-EXECUTION

### 3.1. INSPECTION

A. Examine areas and conditions under which vibration control units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### 3.2. PERFORMANCE OF ISOLATORS

- A. General: Comply with minimum static deflections listed in vibration control schedule or as recommended by ASHRAE, for selection and application of vibration isolation materials and units as indicated.
- B. Manufacturer's Recommendations: Except as otherwise indicated, comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.

#### 3.3. APPLICATIONS

- A. General: Except as otherwise indicated, select vibration control products in accordance with vibration control schedule and ASHRAE Handbook, 1980 Systems Volume, Chapter 35 "Sound and Vibration Control", Table 27. Where more than one type of product is offered, selection is Installer's option.
- B. Piping: For piping connected to equipment mounted on vibration control products, install spring isolation hangers as indicated, and for first 3 points of support for pipe sizes 4 inches and less, for first 4 points of support for pipe sizes 5 inches through 8 inches, and for first 6 points of support for pipe sizes 10 inches and over.

- C. Ductwork: For ductwork connected to equipment mounted on vibration control products, provide flexible duct connections as specified under "Metal Ductwork and Accessories" section and support ductwork using spring isolation hangers for the first three hangers for ducts with the larger dimension of 24" or less and first six hangers for ductwork having a dimension greater than 24".
- D. Equipment: For all rotating or vibrating equipment connected to piping provide flexible pipe connectors. For all rotating or vibrating equipment connected to ductwork provide flexible duct connectors.

### 3.4. INSTALLATION

- A. General: Except as otherwise indicated, comply with manufacturer's instruction for installation and load application to vibration control materials and units. Adjust to ensure that units have equal deflection, do not bottom out under loading, and are not shortcircuited by other contacts or bearing points. Remove space blocks and similar devices intended for temporary support during installation.
- B. Install units between substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.
- C. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where substrate is not level.
- D. Install inertia base frames on isolator units as indicated, so that minimum of 1 inch clearance below base will result when frame is filled with concrete and supported equipment has been installed and loaded for operation.
- E. For air handling equipment, install thrust restraints as indicated, and also wherever thrust exceeds 10% of equipment weight.
- F. Locate isolation hangers as near overhead support structure as possible.
- G. Weld riser isolator units in place as required to prevent displacement from loading and operations.
- H. Flexible Pipe Connectors: Install on equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible. Size to match equipment connection or pipe size, whichever is larger.

### 3.5. ADJUSTING AND CLEANING

- A. Upon completion of vibration control work, prepare report showing measured equipment deflections for each major item of equipment as indicated.
- B. Make final adjustments to vibration control devices while equipment is operating wherever safely possible.
- C. Clean each vibration control unit, and verify that each is working freely, and that there is no dirt or debris in immediate vicinity of unit that could possibly short-circuit unit isolation.

D. Ferrous components of vibration control devices exposed to weather to be painted with two coats of zinc-chromate paint.

SELECTION GUIDE FOR VIBRATION ISOLATORS															
EQUIPMENT LOCATION (1)															
EQUIPMENT	O BASE TYPE	N GRAI ISOL TYPE	DE MIN DEFL	20' FL BASE TYPE	OOR S ISOL TYPE	PAN MIN DEFL	30' FL BASE TYPE	OOR SI ISOL TYPE	PAN MIN DEFL	40' FL BASE TYPE	OOR S ISOL TYPE	PAN MIN DEFL	50' FL BASE TYPE	OOR S ISOL TYPE	PAN MIN DEFL
REFRIGERATION MACHINES ABSORPTION HERMETIC CENT. OPEN CENT. RECIPROCATING: 500 - 750 RPM 751 RPM & OVER	 B  	1 1 1 1	  	 B  	2 2 2 2 2	1.0 1.0 1.0 1.75 1.0	 B A 	2 2 2 2 2	1.75 1.75 1.75 1.75 1.75	 B A A	2 2 2 2 2	1.75 1.75 1.75 2.5 2.5	 A B A A	2 2 2 2 2	1.75 2.5 3.5 3.5 2.5
RECIPROCATING COMPRESSORS & VACUUM PUMPS <sup>(5)</sup> UP THRU 1 HP 1.5 HP & OVER: 500 - 750 RPM 751 RPM & OVER		1 2 2	 1.75 1.0		1 2 2	 1.75 1.0		1 2 2	 2.5 1.75		1 2 2	 2.5 2.5		1 2 2	 3.5 2.5
CENTRIFUGAL PUMPS, COMPRESSORS & VACCUM PUMPS <sup>(2)</sup> <sup>(3)</sup> INLINE: OVER 3/4 HP BASE MOUNTED: UP THRU 5 HP 7.5 HP - 40 HP 50 HP & OVER	  C C	 2 2	 1.0 1.0	 C C C	6 2 2 2	1.0 1.0 1.0 1.0	 C C C	6 2 2 2	1.75 1.75 1.75 1.75	 C C C	6 2 2 2	1.75 1.75 1.75 2.5	 C C C	6 2 2 2	1.75 1.75 1.75 2.5

EQUIPMENT LOCATION (1)															
EQUIPMENT	O BASE TYPE	N GRAI ISOL TYPE	DE MIN DEFL	20' FL BASE TYPE	OOR S ISOL TYPE	PAN MIN DEFL	30' FL BASE TYPE	OOR SI ISOL TYPE	PAN MIN DEFL	40' FL BASE TYPE	OOR S ISOL TYPE	PAN MIN DEFL	50' FL BASE TYPE	OOR SI ISOL TYPE	PAN MIN DEFL
PACKAGED AIR HANDLING UNITS <sup>(4)</sup> SUSPENDED: 1/2 HP - 5 HP 7.5 HP & OVER: UP TO 500 RPM 501 RPM & OVER FLOOR MOUNTED: UP THRU 5 HP 7.5 HP & OVER:		2 2,4	1.0 1.75	   A	6 6,4 6,4 2 2,4	1.0 1.75 1.0 1.0 1.75	  A A	6 6,4 6,4 2 2,4	1.0 1.75 1.0 1.0 1.75	  A A	6 6,4 6,4 2 2,4	1.75 2.5 1.75 1.0 2.5	  A A	6 6,4 6,4 2 2,4	1.75 2.5 1.75 1.0 2.5
501 RPM & OVER		2,4	1.0	A	2,4	1.75	A	2,4	1.75	A	2,4	1.75	А	2,4	1./5
POWER ROOF VENTILATORS ABOVE OCCUPIED AREAS: 7.5 HP & OVER					5	1.0		5	1.0		5	1.0		5	1.0
FANS (BLOWERS), CENTRIFUGAL & AXIAL <sup>(4)</sup>															
1/2 HP - 25 HP: UP TO 200 RPM 201 - 300 RPM 301 - 500 RPM 501 RPM & OVER	B B B B	2,4 2,4 2,4 2,4	1.0 1.0 1.0 1.0	B B B B	2,4 2,4 2,4 2,4	2.5 1.75 1.75 1.75	С С С С	2,4 2,4 2,4 2,4	2.5 2.5 1.75 1.75	С С С С	2,4 2,4 2,4 2,4	3.5 2.5 2.5 1.75	С С С С С	2,4 2,4 2,4 2,4	3.5 3.5 3.5 2.5
30 HP & OVER: UP TO 300 RPM	B B	2,4 2,4	1.75 1.75	C C	2,4 2,4	2.5 1.75 BRATION		2,4 2,4	3.5 2.5	C C	2,4 2,4	3.5 3.5	C C	2,4 2,4 230548	3.5 3.5 3 - 8/9

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301 - 500 RPM	В	2,4	1.0	С	2,4	1.75	С	2,4	1.75	С	2,4	2.5	С	2,4	2.5
OVER SUSPENDED 1/2 HP - 5 HP 7-1/2 & OVER					6 6	1.0 2.5		6 6	1.0 2.5		6 6	1.75 1.75		6 6	1.75 2.5
COOLING TOWERS & FLUID COOLERS <sup>(4)</sup> UP TO 500 RPM 501 RPM & OVER					3 3	1.0 1.0		3 3	1.75 1.0		3 3	2.5 1.75		3 3	3.5 2.5
(ISOLATORS NOT REQUIRED WHERE COOLING TOWER IS LOCATED ON GRADE.)															

#### **VIBRATION ISOLATION NOTES:**

(1) FOR FLOORS ABOVE GRADE LIGHTER THAN 4" CONCRETE, SELECT DEFLECTION REQUIREMENT FROM NEXT HIGHER SPAN.

(2) FOR SEPARATE CHILLER BUILDING ON GRADE, PUMP ISOLATORS MAY BE OMITTED.

(3) DIRECT BOLT FIRE PUMPS TO ISOLATED CONCRETE BASE. PROVIDE ISOLATION FOR PACKAGED PUMP SETS THAT MATCHES TYPE SPECIFIED FOR CORRESPONDING INDIVIDUAL PUMP.

(4) RPM FOR SELECTION OF VIBRATION CONTROL ON FANS EQUIPPED WITH VARIABLE FREQUENCY DRIVES SHALL BE BASED ON 25% OF MAXIMUM DESIGN RPM.

(5) CENTRIFUGAL COMPRESSORS AND VACUUM PUMPS TO BE ISOLATED SIMILAR TO BASE MOUNTED PUMPS.

#### **ISOLATION BASE TYPES:**

A = RAIL B = FABRICATED STRUCTURAL STEEL C = INERTIA BASES

#### ISOLATION DEVICE TYPES:

1 = NEOPRENE OR FIBERGLASS PADS, INC.	2 = HOUSED SPRING	3 = VERTICALLY RESTRAINED SPRING
4 = THRUST RESTRAINT	5 = SPRING ISOLATION CURB	6 = SPRING HANGER

#### END OF SECTION 230548

## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

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.
- B. Division 23 Common Work Results for HVAC and Common HVAC Materials and Methods sections apply to work specified in this section.

#### 1.2. DESCRIPTION OF WORK

- A. Extent of testing, adjusting, and balancing work required by this section is indicated on drawings and schedules, and by requirements of this section; and is defined to include, but is not necessarily limited to mechanical systems, and associated equipment and apparatus of mechanical work. The work consists of setting speed, volume, flow by adjusting valves, dampers, sheaves, etc., as applicable provided for in the systems, confirming proper system function and operation, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required by the Contract Documents.
- B. This work also includes specified duct leak testing.
- C. Component types of testing, adjusting, and balancing specified in this section includes in general the following as applied to mechanical equipment:

#### Ductwork systems

- D. Refer to Division 23 sections for installation and start-up of equipment to be tested, adjusted, and balanced; not work of this section.
- E. Refer to Division 23 sections for pressure testing of piping systems; not work of this section.
- F. The air and water balance shall be performed as:
  - 1. A part of the HVAC contract.

#### 1.3. REFERENCES

- A. ASHRAE-Standard 111--1988 Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems.
- B. ASHRAE--HVAC Applications Handbook: Chapter 34--Testing, Adjusting and Balancing.
- C. AABC--National Standards for Total System Balance.

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- D. NEBB--Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- E. SMACNA--HVAC Systems--Testing, Adjusting and Balancing.
- F. Sheet Metal Industry--Testing, Adjusting, Balancing Bureau (TABB) Certified Technician Standards, Procedures and Specifications.

## 1.4. QUALITY ASSURANCE

- A. Tester's Qualifications: Contractors shall be contractor members in good standing and certified by AABC or NEBB in those testing and balancing disciplines similar to those required for this project, with a minimum of three years of documented balancing experience as a firm and proven capability in work of the type and size as presented by this project.
- B. Codes and Standards:
  - 1. AABC Compliance: Comply with AABC's "AABC National Standards", or NEBB "Procedural Standards for Testing, Balancing and Adjusting" as applicable to mechanical air and hydronic distribution systems, and equipment and apparatus, except where these specifications exceed requirements.
  - 2. Industry Standards: Comply with the latest ASHRAE and Sheet Metal Industry systems volume testing, adjusting, and balancing recommendations pertaining to measurements, instruments, and testing, adjusting, and balancing, except as otherwise indicated.
  - 3. SMACNA Compliance: Comply with the latest edition of the SMACNA testing, adjusting, and balancing manual.
- 1.5. SUBMITTALS
  - A. Submit to the Architect/Engineer for review, prior to commencement of work, a list of equipment and procedures to be used in balancing the systems.
  - B. Submit the same number of copies of the report as required for shop drawings on standard AABC, NEBB or SMACNA forms. The results of the balancing work shall be submitted in report form to the Architect/Engineer no later than 14 days following substantial completion of the HVAC systems. Where test results differ from specified design conditions, indicating a deficiency, include explanation comments in report. The balancing foreman shall sign and date each form in the report under his responsibility and the balancing supervisor's proof of certification shall accompany the report.
  - C. Failure to submit in accordance with the above will be cause for the automatic rejection of the report.
  - D. The test and data sheets shall show all design data:
    - 1. Diffusers, registers and grilles

## 1.6. CEILING ACCESS

- A. The Balancing Contractor shall be fully responsible for removal and reinstallation of lay-in ceiling tile and replacement of any tile damaged by balancing technicians in the performance of this work.
- B. Coordinate required work in areas above inaccessible ceilings in sufficient time to allow balancing before ceilings are installed. Notify Architect/Engineer prior to ceiling installation if this becomes impossible.

## 1.7. GENERAL PROCEDURES

- A. All Systems shall be balanced using a procedure, which results in minimum restrictions being imposed. At completion of balancing (as applicable):
  - 1. At least one damper for an outlet/inlet shall be fully open on every branch duct.
  - 2. At least one branch duct balancing damper shall be fully open on every trunk duct.
  - 3. At least one trunk (zone) balancing damper shall be fully open to each air system.
  - 4. Fan RPM shall be set so the static pressure at the terminal, which is most difficult to serve is adequate, but not excessive.

### 1.8. HVAC CONTRACTOR RESPONSIBILITIES

- A. Prepare each system for testing and balancing.
- B. Cooperate with testing organization, provide access to equipment and systems. Operate systems at designated times, and under conditions required for proper testing, adjusting and balancing.
- C. Coordinate interfacing work between Temperature Control Contractor and testing organization.
- D. Notify testing organization at a minimum seven days prior to time system will be ready for testing, adjusting and balancing.
- E. Replace sheaves based on initial balance information provided by testing organization on driven air equipment requiring same in order to comply with these specifications regarding balance tolerances.
- F. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

### 1.9. WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

- B. Special Guarantee: Provide a guarantee on AABC or NEBB forms stating that AABC or NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
  - 1. The certified Agent has tested and balanced systems according to the Contract Documents.
  - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

# PART 2 - PRODUCTS

# 2.1. EQUIPMENT

- A. Provide all necessary tools, scaffolding and ladders.
- B. Provide all necessary instruments. Instruments shall be used and applied which are best suited to the system function being tested. Instruments shall be in first class state of repair and have been calibrated within a period of six months prior to starting the job. Calibration history of each instrument shall be available for examination. Instruments shall be recalibrated upon completion of the job, if required by the Architect/Engineer to prove reliability.

# PART 3 - EXECUTION

## 3.1. PRELIMINARY PROCEDURES FOR AIR AND HYDRONIC SYSTEM BALANCING

- A. Before operating the system, perform these steps:
  - 1. Obtain design drawings and specifications including all addenda, and construction changes and become thoroughly acquainted with the design intent.
  - 2. Contact the Engineer's authorized representative to review system operation and balancing approach. Document the date of this review, the person contacted and any specific noteworthy items relative to this review in the Balance Report.
  - 3. Obtain copies of approved shop drawings of all applicable mechanical equipment such as pumps, fans, air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
  - 4. Walk the systems to determine variations of installation from design.
  - 5. Check filters for cleanliness.
  - 6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
  - 7. Prepare report test sheets. Obtain manufacturer's data and recommended procedures for testing and balancing.
  - 8. Prepare a summation of required outlet volumes to permit a cross-check with required fan volumes.
  - 9. Determine best locations in main and branch ductwork for most accurate duct traverses.
  - 10. Place outlet dampers in the full open position.
  - 11. Use design drawings of system or "as-built" system layouts to facilitate reporting.

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- 12. Check fan belt tension.
- 13. Check fan rotation.
- 14. Check and set operating set points of equipment in the system to design requirements.
- 15. Open valves to full open position. Close coil bypass valves (if applicable).
- 16. Notify the installing contractor if strainers are suspected to be clogged. Do not proceed until installing contractor cleans strainers.
- 17. Check and set operating setpoints of equipment in the system to design requirements.

# 3.2. GENERAL BALANCE PROCEDURE

- A. The balancing company shall advise the installing contractor of any additional work or rework required to obtain design performance during the course of the balancing work. Such additional work shall be performed prior to the completion of balancing and submission of the balancing report.
- B. The Architect or his representative may make spot checks to determine the accuracy and completeness of final adjustments. Should spot checks indicate more than a reasonable deviation from design requirements, the Balancing Contractor shall repeat tests and adjustments to the satisfaction of the Architect/Engineer.
- C. If any imbalancing occurs which is not the direct result of misoperation by the user during the warranty period, the Balancing Contractor must re-balance as required to obtain proper operating conditions. After or during one complete heating and cooling season, the Balancing Contractor shall make any minor adjustments that may be necessary to insure uniform temperatures throughout the spaces.
- D. Where existing systems are modified requiring revisions in flows, test and record existing flows to remainder of system if not indicated on drawings prior to commencing balancing work and rebalance as required to these values after revisions are complete.

## 3.3. INSTALLATION TOLERANCES

- A. Adjust Air Handling Systems to the following tolerances, unless otherwise specifically indicated for special tolerances. Rooms indicated so that the sum of the air to be removed from the room exceeds the amount to be supplied (negative pressure rooms) shall be balanced to obtain a negative pressure, and conversely, positive pressure rooms shall be balanced to obtain a positive pressure, regardless of tolerances:
  - 1. Supply systems shall be balanced so that:
    - a. The total quantity to each space is within -5% to +10% of design values.
    - b. If two or more outlets in space, each outlet is within -5% to +10% of design value.
    - c. Supply fans are within –5% to +5% of scheduled value.

## 3.4. ADJUSTING

A. Recorded data shall represent actually measured or observed conditions.

- B. Permanently mark settings of valves, dampers, and other adjustment devices, allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing moving part guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

## 3.5. AIR SYSTEM PROCEDURE

- A. Measure and balance air quantities at air inlets and outlets. Diffusers, registers, and grilles shall be balanced using a flow measuring hood or an anemometer as recommended by manufacturer. Area used in calculating airflow shall be net core area. Test readings shall be taken for each supply outlet, return or exhaust inlet. For each of these units obtain and furnish information on manufacturer, testing equipment used, procedure followed, location, size, average velocity, gross and net core areas, observed cfm and specified cfm. Separate tabulations shall be furnished for each manufacturer, each system and each type of register, grille and diffuser. Adjust registers, grilles and diffusers to obtain the best air flow pattern and minimize drafts in all areas.
- B. Adjust Air Handling and Distribution Systems to provide design air quantities.
- C. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Effect volume control at outlets by use of dampers installed in the ductwork as far away from outlets as possible. Do not use volume dampers that are integral with the outlets unless no other balancing damper is available. Adjust all duct dampers, proportioning air flow to minimize adjustments required at individual grilles, registers, and diffusers.
- F. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters. If unloaded filters will cause air quantities in excess of specified tolerances, contact the Engineer to review flow rates before adjusting or selecting replacement sheaves.
- G. Measure temperature conditions across outside air dampers to check leakage. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- H. For each piece of air handling, list the data of the fan, motor and drive and obtain by measurement and furnish in the Balance Report the fan speed, motor voltage, operating amps, cfm and static pressure as determined from the manufacturer's fan curves and determine the fan cfm by means of a velocity traverse which shall be taken a minimum of three fan diameters from fan outlet. Before running any tests, the HVAC Contractor shall have installed all the components of the system and shall insure the

cleanliness of the filters. In the event that the drive assembly requires a change in belts or pulleys, the Balance Contractor shall advise the installing contractor of the size of the replacement equipment, and rebalance the air handling equipment after installation of new drive assemblies. Drive and drive changeout shall be the responsibility of the HVAC Contractor

I. Check for leaks in air handling unit casings, around doors, and coil connections. Report leaks to HVAC Contractor and list uncorrected leaks in report

### 3.6. POST BALANCING WORK

- A. The Balancing Contractor shall patch test holes in insulation, ductwork, and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer, with materials to match, or plastic plugs.
- B. Mark equipment settings, including such items as control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.
- C. Retest, adjust, and balance systems subsequent to significant system modification, and resubmit test results.
- D. Adjust air pattern from adjustable diffusers where excessive velocities are creating a nuisance for occupants.

END OF SECTION 230593

## SECTION 230713 - HVAC DUCT INSULATION

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. Division 23 Common Work Results for HVAC and Common HVAC Materials and Methods sections apply to work specified in this section.
- C. Refer to drawing "Duct Material" schedules which indicate ducts to be insulated.

#### 1.2. SUMMARY

- A. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments, and sealing compounds as applicable to this project.
- B. Related Sections include the following:
  - 1. Division 23 Section "Common HVAC Materials and Methods" for firestopping materials and requirements for penetrations through fire and smoke barriers.
  - 2. Division 23 Section "Common HVAC Materials and Methods" for sound stopping materials and requirements.
  - 3. Division 23 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
  - 4. Division 23 Section "Pipe Insulation" for insulation for piping systems.
  - 5. Division 23 Section "Metal Ductwork and Accessories" for duct liner.

#### 1.3. SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Show typical fabrication and installation details for the following as applicable:
  - 1. Removable insulation sections at access panels.
  - 2. Application of field-applied jackets.
  - 3. Applications at linkages for control devices.
- C. Samples: For each type of insulation and field-applied jacket. Identify each Sample, describing product and intended use. Submit 12-inch- (300-mm-) square sections of each sample material.

- D. Manufacturer's Color Charts: Show the full range of colors available for each type of field-applied finish material indicated.
- E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

## 1.4. OUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smokedeveloped rating of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smokedeveloped rating of 150 or less.

## 1.5. DEFINITIONS

- A. Concealed: Ductwork and plenums concealed from normal view above ceilings and in chases.
- B. Exposed: Ductwork and plenums exposed to view in finished areas, including mechanical and electrical equipment rooms. Attics and crawl spaces where central station air handling units are located are considered to be mechanical equipment rooms.

## 1.6. DELIVERY, STORAGE AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and minimum use temperature.
- B. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site. Insulation made wet or damaged even after installation shall be removed and replaced.

# 1.7. COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

### 1.8. SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

## PART 2 - PRODUCTS

### 2.1. MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mineral-Fiber Insulation:

CertainTeed Manson. Knauf FiberGlass GmbH. Owens-Corning Fiberglas Corp. Johns Manville

- 2. Flexible Elastomeric Thermal Insulation: Armstrong World Industries, Inc. Rubatex Corp.
- Calcium Silicate Insulation: Owens-Coming Fiberglas Corp. Pabco. Johns Manville

## 2.2. INSULATION MATERIALS

- A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612; Form A, Class 1, max. k=0.26 at 75 F mean, up to 250 F, 3.0 PCF density minimum; Type 1B, max. k=0.47 at 300 F mean, up to 850 F, 2.8 PCF density minimum; all without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, max. k=0.31 at 75 F mean, up to 250 F, 0.75 PCF density minimum, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II, max. k=0.28 at 75 F mean, up to 200 F for sheet materials.
  - 1. Adhesive: As recommended by insulation material manufacturer.
  - 2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- D. Calcium Silicate Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C 533, Type I, max. k=0.50 at 300 F mean. For

operating temperatures between 1200 deg F and 1700 deg F (generators), comply with ASTM 533, Type II.

E. The use of PolyBrominated Diphenyl Ethers (PBDE) chemicals when added to plastic and foam products as a flame retardant in HVAC duct and pipe insulation/jacket is prohibited.

# 2.3. FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type I, unless otherwise indicated.
- B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
  - 1. Adhesive: As recommended by insulation material manufacturer.
  - 2. PVC Jacket Color: White or gray.
- D. Mass-Loaded Vinyl Sheet: Smooth finish, high density limp material, minimum 1 lb./sq. ft., 1/8" thickness.
- E. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209 (ASTM B 209M), and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness as follows:

0.024 inch thick 0.032 inch thick 0.040 inch thick

- 1. Finish: Smooth finish, 0.016 inch thick.
- 2. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
- F. The use of PolyBrominated Diphenyl Ethers (PBDE) chemicals when added to plastic and foam products as a flame retardant in HVAC duct and pipe insulation/jacket is prohibited.

# 2.4. ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz/sq. yd. (270 g/sq. m).
  - 1. Tape Width: 4 inches (100 mm).
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
  - 1. Aluminum: 0.007 inch (0.18 mm) thick.

- C. Wire: stainless steel; or 0.062-inch (1.6-mm) steel.
- D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitordischarge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
  - 1. Welded Pin Holding Capacity: 100 lb (45 kg) for direct pull perpendicular to the attached surface.
- E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
  - 1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.
- F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

### 2.5. VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

## PART 3 - EXECUTION

#### 3.1. EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2. PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

## 3.3. GENERAL APPLICATION REOUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

- B. Refer to schedules for materials, forms, jackets, and thicknesses required for each duct system. Unless otherwise indicated, furnish and install insulations of the same type for the same service throughout this work.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- F. Clean and dry ductwork prior to insulating.
- G. Keep insulation materials clean and dry during application and finishing.
- H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- I. Apply insulation with the least number of joints practical.
- J. Apply insulation over fittings and specialties, with continuous thermal and vaporretarder integrity, unless otherwise indicated.
- K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- L. Insulation Terminations: Seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder. No exposed fiberglass will be permitted.
- M. Apply insulation with integral jackets as follows:
  - 1. Pull jacket tight and smooth.
  - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
  - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- N. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- O. Install vapor-retarder mastic on ducts and plenums.
  - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
- P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

- 1. Seal penetrations with vapor-retarder mastic.
- 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
- 3. Seal insulation to roof flashing with vapor-retarder mastic.
- Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Refer also to sound stopping requirements.
- R. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations. Refer to drawing details and fire and sound stopping requirements.
- S. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
  - 1. Taper termination and seal insulation ends for ducts with vapor-retarder mastic.

# 3.4. MINERAL-FIBER INSULATION APPLICATION

- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
  - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  - 3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    - b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
    - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
  - 4. Impale insulation over anchors and attach speed washers.
  - 5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  - 6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.

- 7. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.
- 8. Apply insulation on duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch-(150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
- 10. Apply vapor-retarder mastic for ducts other than flues to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.
- B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
  - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  - 3. Space anchor pins as follows:
    - a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    - b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
    - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
  - 4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  - 5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
  - 6. Apply insulation on duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  - 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch-(150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (*150* mm) o.c.
  - 8. Apply vapor-retarder mastic for ducts other than flues to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

## 3.5. FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

- A. Apply insulation to ducts and plenums as follows:
  - 1. Follow the manufacturer's written instructions for applying insulation.
  - 2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the duct and plenum surface.
- B. Coat exposed outdoor flexible elastomeric insulation with two coats of manufacturer's recommended protective white coating.

### 3.6. FIELD-APPLIED JACKET APPLICATION

- A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
  - 1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
  - 2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
  - 3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
- B. Apply PVC jacket where indicated, with 1-inch (25-mm) overlap at longitudinal seams and joints. Seal with manufacturer's recommended adhesive for a completely waterproof installation.
- C. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer for a waterproof installation. Secure jacket with stainless steel bands 2 inches (300 mm) o.c. and at end joints.
- D. Apply mass-loaded vinyl wrap, where indicated on plans, directly over bare insulation or insulation with factory-applied jackets.
  - 1. Install per manufacturers requirements.
  - 2. Completely encapsulate insulation with jackets, leaving no exposed raw insulation.
  - 3. Use only weld-attached anchor pins and washers (no adhesive attached).

## 3.7. FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 23 Section "Basic Mechanical Materials and Methods".

## 3.8. DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the scheduled plenums and duct systems.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment as applicable:
  - 1. Metal ducts with duct liner.
  - 2. Factory-insulated flexible ducts.
  - 3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
  - 4. Ductwork flexible connectors.
  - 5. Vibration-control devices.
  - 6. Testing agency labels and stamps.
  - 7. Nameplates and data plates.
  - 8. Access panels and doors in air-distribution systems.
- E. General: Where more than one material is indicated for a particular service, choice of listed material is installers option, unless otherwise indicated in duct material schedule on drawings.

## 3.9. INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. General: Where more than one material is indicated for a particular service, choice of listed material is installers option, unless otherwise indicated in duct material schedule on drawings.
- B. Service: Round ducts, concealed.
  - 1. 2 inch thick mineral fiber blanket, foil and paper jacket
  - 2. 2 inch thick mineral fiber blanket, all service jacket and PVC jacket.
  - 3. Include mass-loaded vinyl sheet wrap where indicated on plans
  - 4. <sup>1</sup>/<sub>2</sub>" flexible elastomeric insulate hangers and flanges.
- C. Service: Rectangular ducts, concealed:
  - 1. 2 inch thick mineral fiber blanket, foil and paper jacket
  - 2. 2 inch thick mineral fiber blanket, all service jacket and PVC jacket.
  - 3. Include mass-loaded vinyl sheet wrap where indicated on plans.
  - 4. Include all terminal unit reheat coils
  - 5. <sup>1</sup>/<sub>2</sub>" flexible elastomeric insulate hangers and flanges.
- D. Service: Round ducts, exposed:
  - 1. 2 inch thick (max 250 F) mineral fiberboard, glass cloth jacket

- 2 inch thick (max 250 F) mineral fiberboard, all service jacket and PVC jacket 1 inch thick (max 200 F) flexible elastomeric 2.
- 3.
- Ε. Service: Rectangular ducts, exposed.
  - 1.
  - 2 inch thick (max 250 F) mineral fiberboard, glass cloth jacket 2 inch thick (max 250 F) mineral fiberboard, all service jacket and PVC jacket 2.

END OF SECTION 230713

## SECTION 230719 - PIPE INSULATION

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. Division 23 Common Work Results for HVAC and Common HVAC Materials and Methods sections apply to work specified in this section.

#### 1.2 SUMMARY

- A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds, as applicable to this project.
- B. Related Sections include the following:
  - 1. Division 23 Section "Common HVAC Materials and Methods" for firestopping materials and requirements for penetrations through fire and smoke barriers.
  - 2. Division 23 Section "Common HVAC Materials and Methods" for sound stopping materials and requirements.
  - 3. Division 23 Section "Duct Insulation" for insulation for ducts, flues and plenums.
  - 4. Division 23 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
  - 5. Division 23 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

#### 1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Show typical fabrication and installation details for the following as applicable:
  - 1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
  - 2. Attachment and covering of heat trace inside insulation.
  - 3. Insulation application at pipe expansion joints for each type of insulation.
  - 4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 5. Removable insulation at piping specialties and equipment connections.
  - 6. Application of field-applied jackets.

- C. Samples: For each type of insulation and jacket. Identify each Sample, describing product and intended use. Submit Samples in the following sizes:
  - 1. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN50).
  - 2. Sheet Form Insulation Materials: 12 inches (300 mm) square.
  - 3. Jacket Materials: 12 inches (300 mm) long by NPS 2 (DN50).
- D. Manufacturer's Color Charts: Show the full range of colors available for each type of field-applied finish material indicated.
- E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Fire-Test-Response Characteristics: as determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smokedeveloped rating of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smokedeveloped rating of 150 or less.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- B. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site. Insulation made wet or damaged even after installation shall be removed and replaced.

## 1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports".
- B. Coordinate clearance requirements with piping installer for insulation application.

C. Coordinate installation and testing of heat tracing.

### 1.7 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - Mineral-Fiber Insulation: CertainTeed Manson. Knauf FiberGlass GmbH. Owens-Corning Fiberglas Corp. Johns Manville
  - 2. Cellular-Glass Insulation:
    - Pittsburgh-Corning Corp.
  - 3. Flexible Elastomeric Thermal Insulation: Armstrong World industries, inc. Rubatex Corp.
  - 4. Removable/Reusable Insulation Covers: Advance Thermal Corp. Flex Pack Insultech/Shannon Multicover Roc-Co Company

## 2.2 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
  - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1 up to 850 deg F, (ASTM C547 Type II for operating temperatures from 850 to 1200 deg F), max k=0.25 at 100 F mean with factory-applied, all-purpose vapor-retarder jacket.
  - 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
    - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
    - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
- 3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
- 4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
- 5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
- 6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible, with factory-applied, all-purpose, vapor-retarder jacket.
  - 1. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2, max k=0.33 at 75 F mean, up to 900 F.
- C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials, max k=0.28 at 75 F mean, up to 200 F.
  - 1. Adhesive: As recommended by insulation material manufacturer.
  - 2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- D. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- E. The use of PolyBrominated Diphenyl Ethers (PBDE) chemicals when added to plastic and foam products as a flame retardant in HVAC duct and pipe insulation/jacket is prohibited.

# 2.3 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
  - 1. Adhesive: As recommended by insulation material manufacturer.
  - 2. PVC Jacket Color: White or gray.
  - 3. PVC Jacket Color: Color-code piping jackets based on materials contained within the piping system. Coordinate color requirements with Architect/Engineer.
- C. Heavy PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 30mil- (0.75-mm-) thick, high-impact, ultraviolet-resistant PVC.
  - 1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
  - 2. Adhesive: As recommended by insulation material manufacturer.
- D. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.

- 1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
- 2. Adhesive: As recommended by insulation material manufacturer.
- E. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.
  - 1. Finish and Thickness: Corrugated finish, 0.016 inch.
  - 2. Moisture Barrier: Where vapor retardant jacket is indicated, utilize 1-mil- (0.025mm-) thick, heat-bonded polyethylene and kraft paper.
  - 3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.
- F. The use of PolyBrominated Diphenyl Ethers (PBDE) chemicals when added to plastic and foam products as a flame retardant in HVAC duct and pipe insulation/jacket is prohibited.

# 2.4 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
  - 1. Tape Width: 4 inches (100 mm).
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
  - 1. Aluminum: 0.007 inch (0.18 mm) thick.
- C. Wire: 0.080-inch (2.0 mm), nickel-copper alloy; 0.062-inch (1.6 mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

#### 2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

#### 2.6 MINERAL WOOL REMOVABLE/REUSEABLE CONTOUR FIT INSULATION COVERS

A. Covers shall conform to shape of device covered. Inner and outer jacketing and gussets shall be ATC Steamguard-1 cloth. Insulation shall be 2" thick 6 lb. density Cera-wool. Thread shall be 3-ply Nomex thread. Seam fasteners shall be Steamguard-1 belts with double stainless steel welded D-rings. Furnish with stainless steel I.D. tags with embossed lettering, riveted to flaps.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system. Unless otherwise indicated, furnish and install insulations of the same type for the same service throughout this work.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- H. Keep insulation materials clean and dry during application and finishing.
- I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- J. Apply insulation with the least number of joints practical.
- K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties. Insulate flanges, unions,

strainer outlets and plug valve plugs with pressure fit removable and replaceable covers. Do not restrict valve operation in any way.

- L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
  - 1. Apply insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
  - 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- M. Insulation Terminations: Taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder, and to seal fiberglass. No exposed fiberglass will be permitted.
- N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- O. Apply insulation with integral jackets as follows:
  - 1. Pull jacket tight and smooth.
  - 2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
  - 3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
    - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
  - 4. Vapor Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
  - 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- P. Roof Penetrations: Unless otherwise detailed, apply insulation for interior applications to a point even with top of roof flashing.
  - 1. Seal penetrations with vapor-retarder mastic.
  - 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
  - 3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.

- 4. Seal metal jacket to roof flashing with vapor retarder mastic.
- Q. Exterior Wall Penetrations: Unless otherwise detailed, for penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.
- R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partition. Refer also to sound stopping requirements.
- S. Fire-Rated Wall and Partition Penetrations: Apply insulation through penetrations of fire-rated walls and partitions. Refer to drawing details and fire and sound stopping specification requirements.
- T. Floor Penetrations: Apply insulation continuously through floor assembly.
  - 1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder. Maintain fire rating as applicable.

# 3.4 MINERAL-FIBER INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows:
  - 1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
  - 2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
  - 3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
  - 4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
- B. Apply insulation to flanges as follows:
  - 1. Apply preformed pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
  - 4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.
  - 5. See flexible elastomeric insulation application for additional flange insulation information.
- C. Apply insulation to fittings and elbows as follows:

- 1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
- 2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
- 3. Cover fittings with standard PVC fitting covers. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retardant mastic.
- 4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
- D. Apply insulation to valves and specialties as follows:
  - 1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
  - 2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
  - 3. Apply insulation to flanges as specified for flange insulation application.
  - 4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
  - 5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor retarder mastic.
  - 6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.
  - 7. See flexible elastomeric insulation application for additional valve and specialty information.

# 3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows:
  - 1. Follow manufacturer's written instructions for applying insulation.
  - 2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- B. Apply insulation to flanges as follows:
  - 1. Apply pipe insulation to outer diameter of pipe flange.

- 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
- 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
- 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- 5. Flanges at equipment connections at temperatures less than 220 deg F which must be regularly accessed for equipment servicing (e.g. chiller connections), shall be insulated with minimum 3/4" thick flexible elastomeric, factory fabricated removable/reusable covers. Covers to be tight fitting, complete with velcro closures. Covers to be as manufactured by Corick, (504) 356-5830.
- C. Apply insulation to fittings and elbows as follows:
  - 1. Apply mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- D. Apply insulation to valves and specialties as follows:
  - 1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
  - 2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to strainer basket.
  - 3. Apply insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid opening in insulation that will allow passage of air to the pipe surface.
  - 5. As an alternative to the valve as specialties insulation methods indicated above, insulate the following valves and specialties in sizes 2-1/2" and larger handling media at temperatures less than 220 deg F with minimum 3/4" flexible elastomeric insulation insulation or factory fabricated removable/reusable covers. Covers to be tight fitting, conforming to device contours with velcro closures. Covers to be as manufactured by Corick, (504) 356-5830.
    - a. Valves.
    - b. Strainers (provide removable/reusable section for basket removal if entire cover is not easily removable/reusable).
    - c. Suction diffusers (provide removable/reusable section for basket removal if entire cover is not easily removable/reusable).
    - d. Flexible connectors.
- E. Coat exposed outdoor flexible elastomeric insulation after adhesive has fully cured with two coats of manufacturer's recommended protective white coating.

# 3.6 FIELD APPLIED JACKET APPLICATION

- A. Apply PVC jacket where indicated, with 1-inch (25 mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive for a completely sealed waterproof installation. Completely sealed system shall comply with requirements of USDA and FDA.
- B. Apply metal jacket where indicated, with 2-inch (50 mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer for a waterproof installation. Secure jacket with stainless steel bands 12 inches (300 mm) o.c. and at end joints.

# 3.7 REMOVABLE/REUSABLE INSULATION COVER APPLICATION

A. Install removable/reusable covers where indicated, selected specifically for the intended service. Each cover shall be easily removed and reapplied with a closely contoured fit for optimal thermal performance and aesthetics.

# 3.8 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment as applicable:
  - 1. Flexible connectors on other than cold piping systems.
  - 2. Fire-suppression piping (exclusive).
  - 3. Drainage piping located in crawl spaces, unless otherwise indicated.
  - 4. Below-grade piping, unless otherwise indicated.
  - 5. Chrome-plated pipes and fittings, unless potential for personnel injury.
- C. HVAC Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinet provided piping is located over drain pan; and on heating water piping unions, and strainers 2 inch and smaller, heating water piping flexible connectors and expansion joints 2 inches and smaller.

# 3.9 FIELD QUALITY CONTROL

- A. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
  - 1. Inspect insulation assembly of fittings and valves randomly selected by Architect/Engineer.
- B. Insulation applications will be considered defected if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

- C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.
- D. All wet or damaged insulation shall be removed and replaced.
- 3.10 INSULATION APPLICATION SCHEDULE, GENERAL
  - A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.
  - B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements. Where more than one material is indicated for a particular service, choice of listed material is installer's option, unless otherwise specifically indicated.
- 3.11 INTERIOR PIPE INSULATION APPLICATION SCHEDULE
  - A. Air Conditioning Condensate Drain Piping (35 to 75 deg F):
    - 1. Flexible elastomeric; 3/4 inch thick, sizes up through 8 inches.
    - 2. Mineral fiber with vapor retardant all service jacket; 1 inch thick.
      - a. with PVC jacket (where indicated on drawings only).
      - b. with aluminum jacket (where indicated on drawings only).
      - c. with stainless steel jacket (where indicated on drawings only).
  - B. Refrigerant Suction, Hot Gas (and Liquid for Mini-Split Systems) Piping (35 to 120 deg F):
    - 1. Flexible elastomeric; 3/4 inch thick.
    - 2. Mineral fiber with vapor retardant all service jacket; 1 inch thick.
      - a. with PVC jacket (where indicated on drawings only).
      - b. with aluminum jacket (where indicated on drawings only).
      - c. with stainless steel jacket (where indicated on drawings only).

#### 3.12 EXTERIOR PIPE INSULATION

- A. This application schedule is for aboveground insulation outside the building.
- B. Exterior refrigerant suction piping (35 to 50 deg F):
  - 1. Flexible elastomeric; 3/4 inch thick sizes, 1 inch and smaller, 1 inch thick for sizes over 1 inch, with two coats manufacturer's white exterior protective finish.
  - 2. Polyolefin, 3/4 inch thick sizes, 1 inch and smaller, 1 inch thick for sizes over 1 inch, with two coats manufacturer's white exterior protective finish.

END OF SECTION 230719

# SECTION 230900 - ELECTRONIC CONTROL SYSTEMS

PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

- A. General provisions of the Contract, including General and Supplementary Conditions, and Special Conditions, Division 01 Specification Sections and Drawings, apply to this Section.
- B. Division 23 Common Work Results for HVAC and Basic HVAC Materials and Methods sections apply to work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of electric/electronic control systems work required by this section is indicated on drawings and schedules, and by requirements of this section.
  - 1. Control sequences are on the temperature control drawings.
- B. Refer to other Division 23 sections for installation of instrument wells, valve bodies, and dampers in mechanical systems; not work of this section. Coordinate locations of such with Mechanical Contractor.
- C. Refer to Division 26 sections for the following work; not work of this section.
  - 1. Power supply wiring for power source to power connection on controls and/or unit control panels. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
- D. Provide the following electrical work as work of this section, complying with requirements of Division 26 sections:
  - 1. Control wiring between field-installed controls, indicating devices, and unit control panels.
  - 2. Control wiring between field installed VRF devices.
  - 3. Interlock wiring between electronically-operated equipment units; and between equipment and field-installed control devices.
    - a. Interlock wiring specified as factory-installed is work of this section.

#### 1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of electric control equipment, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

- B. Installer's Qualifications: Firms under the employ of the manufacturer specializing and experienced in electric control system installations for not less than 3 years.
- C. Codes and Standards:
  - 1. Electrical Standards: Provide electrical products which have been tested, listed and labeled by UL and comply with NEMA standards.
  - 2. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.
  - 3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, and including installation instructions and start-up instructions.
- B. Shop Drawings: Submit shop drawings for each electric control system, containing the following information:
  - 1. Schematic flow diagram of system showing fans, pumps, coils, dampers, valves, and control devices.
  - 2. Label each control device with setting or adjustable range of control.
  - 3. Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
  - 4. Provide details of faces of control panels, including controls, instruments, and labeling.
  - 5. Include verbal description of sequence of operation.
- C. Maintenance Data: Submit maintenance instructions and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Divisions 01 and 26.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide factory shipping cartons for each piece of equipment, and control device. Maintain cartons through shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protected from weather.

## 1.6 WARRANTY

A. Verify operation of systems prior to end of one year warranty period. Make all required adjustments if necessary to return systems to specified and accepted sequence of operation. All costs for this warranty are to be included in bid.

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# PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide electric control systems by same manufacturer and installer as the Facility Management System or Johnson Controls by Engineered Building Systems.

#### 2.2 MATERIALS AND EQUIPMENT

- A. General: Provide electric control products in sizes and capacities indicated, consisting of sensors and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer.
- B. Operators: Size actuators to operate their appropriate dampers or valves with sufficient reserve power to provide smooth modulating action or 2-position action as specified.

PART 3 - EXECUTION

#### 3.1 INSPECTION

A. Examine areas and conditions under which electric control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### 3.2 INSTALLATION OF ELECTRIC CONTROL SYSTEMS

- A. General: Install systems and materials in accordance with manufacturer's instructions and roughing-in drawings, and details on drawings. Install electrical components and use electrical products complying with requirements of Division 26 sections of these specifications. Note use of plenum rated materials in return air plenums.
- B. Control Wiring: The term "control wiring" is defined to include providing of wire, conduit and miscellaneous materials as required for mounting and connecting electric control devices. Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in complete accordance with Division 26 of this specification.
  - 1. Install circuits over 25-volt with color-coded No. 12 wire in electric metallic tubing.
  - Install circuits under 25-volt with color coded No. 18 wire with 0.031" high temperature [105 deg F (41 deg C)] plastic insulation on each conductor and plastic sheath over all.

ELECTRONIC CONTROL SYSTEMS

- 3. Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.
- 4. Install low voltage circuits, located in concrete slabs and masonry walls, or exposed in occupied areas, in electrical conduit.
- C. Wiring System: Install complete control wiring system for electric control systems. Conceal wiring, except in mechanical rooms and areas where other conduit and piping are exposed. Provide multi-conductor instrument harness (bundle) in place of single conductors where number of conductors can be run along common path. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.
- D. Number-code or color-code conductors, excluding those used for local individual room controls, appropriately for future identification and servicing of control system.

# 3.3 ADJUSTING AND CLEANING

- A. Start-Up: Start-up, test, and adjust electric control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- C. Final Adjustment: After completion of installation, adjust setpoints and equipment provided as work of this section.
  - 1. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.

END OF SECTION 230900

# SECTION 232300 – REFRIGERANT PIPING

## 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 this Section.
- B. Requirements of the following Division 23 Sections apply to this section:

Basic HVAC Materials and Methods. Common Work Results for HVAC. Hangers and Supports for HVAC Piping and Equipment.

#### 1.2 SUMMARY

- A. This Section includes refrigerant piping used for air conditioning applications. This Section includes:
  - 1. Pipes, tubing, and fittings.
  - 2. Special duty valves.
  - 3. Refrigerant specialties.
  - 4. Refrigerants.
- B. Related Sections: The following Sections, as well as other Division 23 sections, contain requirements that relate to this section:
  - 1. Division 23, Section "Hangers and Supports for HVAC Piping and Equipment " for roof curbs, piping supports, and roof penetration boots, not furnished with equipment.
  - 2. Division 23, Section "Identification For HVAC Piping and Equipment " for labeling and identification of refrigerant piping.
  - 3. Division 23, Section "HVAC Piping Insulation" for pipe insulation.
- C. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of or separately with packaged air conditioning equipment.

#### 1.3 SUBMITTALS

- A. Product data for each type of product specified in this section.
- B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximate to equipment.

C. Maintenance data for products specified in this section, for inclusion in Operating and Maintenance Manual specified in Division 01 and Division 23 Section "Common Work Results for HVAC."

### 1.4 QUALITY ASSURANCE

- A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Regulatory Requirements: Comply with provisions of the following codes:
  - 1. ANSI B31.5: ASME Code for Pressure Piping Refrigerant Piping.
  - 2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration.
  - 3. Ohio Building Code (OBC).
- 1.5 SEQUENCING AND SCHEDULING
  - A. Coordinate the installation of roof piping supports, and roof penetrations.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Refrigerant Valves and Specialties:

Alco Controls Div., Emerson Electric. Danfoss Electronics, Inc. EATON Corporation, Control Div. Henry Valve Company. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division. Sporlan Valve Company

### 2.2 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3, Article "PIPE APPLICATION" for identification of systems where the below specified pipe and fitting materials are used.
- B. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.
- C. Copper Tubing: ASTM B 88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

## 2.3 FITTINGS

A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern. Elbows shall be long radius type.

### 2.4 JOINING MATERIALS

A. Joints: Copper to copper joints shall be made using phosphorous bearing alloy such as "Silphos" without flux. Copper to brass or steel joints shall be made using a 45% silver alloy such as "Easy-flo" with flux.

### 2.5 VALVES

- A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.
- B. Ball Valves: 500 psig maximum operating pressure, temperature range -40 deg F to +300 deg F, forged brass body, brass ball with equalizing orifice, Teflon ball seals, mechanical stem stops providing positive ball port position, sealed blow-out proof stem and seal cap, flow direction arrows.
- C. Globe Valves: 450 psig maximum operating pressure, 275 deg F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.
- D. Check Valves Smaller than 7/8 inch: 500 psig maximum operating pressure, 300 deg F maximum operating temperature; cast brass body with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.
- E. Check Valves 7/8 inch and Larger: 450 psig maximum operating pressure, 300 deg F maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Valve shall be straight through or angle pattern, with solder-end connections.
- F. Solenoid Valves: 250 deg F temperature rating, 400 psig working pressure; forged brass, with Teflon valve seat, two-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2 inch conduit adaptor, and (unless otherwise indicated) 24 volt, 60 HZ. normally closed holding coil.
- G. Evaporator Pressure Regulating Valves: pilot-operated, forged brass or cast bronze; complete with pilot operator, stainless steel bottom spring, pressure gage tappings (unless otherwise indicated), 24 volts DC, 60 Hz, standard coil; and wrought copper fittings for solder end connections.
- H. Thermal Expansion Valves: Thermostatic adjustable, modulating type, size as required for specific evaporator requirements, and factory set for proper evaporator superheat requirements. Valves shall have copper fittings for solder end connections; complete with

sensing bulb, a distributor having a side connection for hot gas bypass line, and an external equalizer line.

I. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connection.

### 2.6 REFRIGERANT PIPING SPECIALTIES

- A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.
- B. Strainers: 500 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
- C. Moisture/liquid Indicators: 500 psig maximum operation pressure, 200 deg F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.
- D. Filter-driers: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets, as follows:
  - 1. Standard capacity desiccant sieves to provide micronic filtration.
  - 2. High capacity desiccant sieves to provide micronic filtration and extra drying capacity.
- E. 00A. 0 0 Suction Line Filter-Drier: 350 psig maximum operation pressure, 225 deg F maximum operating temperature; steel shell, and wrought copper fittings for solder end connections. Permanent filter element shall be molded felt core surrounded by a desiccant for removal of acids and moisture for refrigerant vapor.
- F. Suction Line Filters: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter core kit, including gaskets, as follows:
- G. 00B. 0 0 Flanged Unions: 400 psig maximum working pressure, 330 deg F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8 inch through 1-5/8 inch unions shall be forged steel, and for 2-1/8 inch through 3-1/8 inch shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory-applied rust-resistant coating.
- H. Flexible Connectors: 500 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.

#### 2.7 REFRIGERANT

A. Refrigerant type per manufacturer's equipment in accordance with ASHRAE Standard, meeting current refrigerant regulations.

B. Coordinate component sizing with refrigeration equipment manufacturer.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.

### 3.2 PIPE APPLICATIONS

- A. Use Type L, or Type ACR drawn copper tubing with wrought copper fittings and brazed joints. Mechanical fittings (crimp or flair) are not permitted.
- B. If other than Type ACR tubing is used, clean and protect inside of tubing as specified in Article "CLEANING" below.

#### 3.3 PIPING INSTALLATIONS

- A. General: Install refrigerant piping in accordance with ASHRAE Standard 15 "The Safety Code for Mechanical Refrigeration."
- B. Piping shall be cut using a tubing cutter only. Hack saw cuts are prohibited.
- C. Install piping in as short and direct arrangement as possible to minimize pressure drop.
- D. Install piping for minimum number of joints using as few elbows and other fitting as possible.
- E. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.
- F. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.
- G. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.
- H. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- I. Slope refrigerant piping as follows:
  - 1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
  - 2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.

- 3. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
- 4. Liquid lines may be installed level, unless otherwise indicated.
- J. Use fittings for all changes in direction and all branch connections.
- K. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- L. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- M. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- N. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- O. Locate groups of piper parallel to each other, spaced to permit applying insulation and servicing of valves.
- P. Fire and Smoke Barrier Penetrations: Where pipes pass through fire or smoke rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to other Division 23 section for special sealers and materials.
- Q. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- R. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators and elsewhere as indicated on Drawings.
- S. Install flexible connectors at the inlet and discharge connection of compressors.

#### 3.4 HANGERS AND SUPPORTS

- A. General: Hanger, supports, and anchors are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Conform to the table in that section for maximum spacing of supports:
- B. Isolate hangers from piping to eliminate transmission of pipe vibration and sound.

#### 3.5 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
  - 1. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
  - 2. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems,

seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.

- B. Fill the pipe and fittings during brazing, with an inert gas (ie., nitrogen or carbon dioxide) to prevent formation of scale.
- C. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

### 3.6 VALVE INSTALLATIONS

- A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.
- B. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
  - 1. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
  - 2. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
  - 3. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
  - 4. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.
- C. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

### 3.7 EQUIPMENT CONNECTIONS

- A. The Drawings indicate the general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow servicing and maintenance, and in accordance with equipment manufacturer's recommendations.

### 3.8 FIELD QUALITY CONTROL

- A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5. Chapter VI.
- B. Repair leaking joints using new materials, and retest for leaks.

### 3.9 CLEANING

- A. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
  - 1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
  - 2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.

- 3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
- 4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

## 3.10 ADJUSTING

- A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

#### 3.11 COMMISSIONING

- A. Charge system using the following procedure:
  - 1. Install core in filter dryer after leak test but before evacuation.
  - 2. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
  - 3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
  - 4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
  - 5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
  - 6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.
- B. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping valves and refrigerant piping specialties.
- C. Review data in Operating and Maintenance Manuals. Refer to Division 01 section "Project Closeout", and Section 230500.
- D. Schedule training with Owner through the Architect/Engineer, with at least 7 days advance notice.

END OF SECTION 232300

# SECTION 233113 – METAL DUCTWORK AND ACCESSORIES

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.
- B. Division-23 Common Work Results for HVAC and Basic HVAC Materials and Methods sections apply to work specified in this section.
- C. Division-23 Vibration and Seismic Control for HVAC Piping and Equipment section applies to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section.
- B. Refer to other Division-23 sections for exterior insulation of metal ductwork; not work of this section.
- C. Refer to other Division-23 section for automatic temperature dampers control furnished under that section but installed as work of this section.

### 1.3 QUALITY ASSURANCE

- A. Codes and Standards:
  - 1. OBC: Comply with the latest edition of The Ohio Building Code (OBC), Mechanical Code.
  - 2. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" and NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems".
  - 3. SMACNA Standards: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork, except where exceeded by this specification.
  - 4. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
  - 5. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
  - 6. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
  - Welding: Qualify welding processes and operators in accordance with AWS D1.1 "Structural Welding Code - Steel" for hangers and supports and AWS D9.1 for "Sheet Metal Welding Code".

# 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for type of equipment and material used. Include details of construction, joining methods, and materials and methods showing compliance with each item of this specifications section.
- B. Shop Drawings: Submit scaled layout drawings (not smaller than scale used on contract documents) of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced. Shop drawings are to be created in Autodesk Revit 3-D and Revit file is to be submitted to the engineer for approval.
- C. Record Drawings: At project closeout, submit record drawings of installed metal ductwork and ductwork products, in accordance with requirements of Divisions 1 and 23. Record drawings are to be submitted in Autodesk 3-D. The 3-D model is to be updated monthly during construction and is to be submitted to the engineer on a monthly basis. The 3-D model shall clearly show installation progress.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.
- B. Storage: Store all ductwork inside, protected from weather off of ground and concrete on pallets.

# PART 2 - PRODUCTS

#### 2.1 DUCTWORK MATERIALS

- A. Provide ductwork of materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.
- B. Duct Liner: Fibrous glass, complying with Thermal Insulation Manufacturers Association (TIMA) ACH-101; of thickness indicated.
  - 1. Materials: ASTM C1071, Type I or II, for acoustical performance. Coating to include an acrylic polymer to prevent facing delamination and fiber shedding, and to promote future cleaning of ducts. Coating shall include an immobilized EPA registered antimicrobial agent which will not support the growth of fungus, mold or bacteria, tested in accordance with the requirements of ASTM G21 and G22, as well as

UL181. Water vapor sorption shall be less than 3% by weight at 120 deg. FI, 95% RH.

- a. Thickness: 1 inch with 3 PCF density
- 2. Thermal Performance: "K-Factor" equal to 0.26 or better, at a mean temperature of 75 deg F, ASTM C177. Maximum operating temperature shall be 250 deg. F or greater.
- 3. Fire Hazard Classification: Flame spread rating of not more than 25 without evidence of continued progressive combustion and a smoke developed rating of no higher than 50, when tested in accordance with ASTM C411.
- 4. Duct Liner Adhesive: Comply with ASTM C916 "Specification for Adhesives for Duct Thermal Insulation", and resistant to fungal and bacterial growth when subjected to microbial attack as defined in ASTM C665 and standard practices ASTM G21 and G22.
- 5. Duct Liner Fasteners: Comply with SMACNA HVAC Duct construction Standards, Article S2.11.
- C. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A527, lock-forming quality; with G 90 zinc coating in accordance with ASTM A527 and ASTM A924; and mill phosphatized for painted locations.

### 2.2 MISCELLANEOUS DUCTWORK MATERIALS

- A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Duct sealant shall be UL classified and tested in accordance with UL Standard 723. Duct sealant shall meet NFPA 90A Class I requirements (flamespread of 25 and smoke developed 50) when applied in a manner consistent with its intended use. Duct sealant shall be furnished and installed in accordance with SMACNA Standards, Paragraph S1.8 and S1.9. Oil based sealing compounds are not acceptable.
- C. Ductwork Support Materials: Comply with SMACNA Standards Section 4. Except as otherwise indicated, provide hot-dipped galvanized steel or zinc plated fasteners, anchors, rods, straps, trim and angles for support of ductwork. "C" clamps without a beam retaining strap shall not be used to attach hanging devices.
  - 1. For exposed stainless steel ductwork, provide matching stainless steel support materials.
  - 2. For aluminum ductwork, provide aluminum support materials except where materials are electrolytically separate from ductwork.
- D. Flexible Ducts: Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum; complying with NFPA 90A and UL 181, and as required for pressure classification of ductwork system. Flexible ducts shall be sound attenuating type.

- 1. Provide 1" thick continuous flexible fiberglass sheath with vinyl or aluminum vapor barrier jacket for all flexible ducts, unless otherwise indicated.
- 2. Flexible duct clamps shall be stainless steel band with cadmium-plated hex screw to tighten band with a worm gear action or heavy duty nylon adjustable self-locking clamps, clamp shall be adjustable until tensioned and cut-off with the banding tool, after which the band is permanent until cut-off. Banding tool specific to the brand of nylon clamp shall be used. Seal all flexible duct insulation ends completely with duct tape.
- 3. Provide flexible ducts as manufactured by ATCO Rubber Products, Inc.; Genflex, Type SFR-25A; Clevaflex Type SFV or Thermaflex.

# 2.3 DUCTWORK FABRICATION

- A. General:
  - 1. Factory fabricate or shop fabricate ductwork as indicated on the drawings and in schedules.
  - 2. Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
  - 3. Shop fabricate ductwork of gages and reinforcement strictly complying with the latest edition of SMACNA "HVAC Duct Construction Standards", for pressure classification indicated on the drawings and in schedules. If not indicated elsewhere, ductwork shall be constructed to a minimum standard of 2 inch water column.
  - 4. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1-1/2 times associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.
  - 5. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible.
  - 6. Joint reinforcement manufactured by Ductmate Industries or other such manufacturers will be acceptable as long as all duct gages, intermediate reinforcement and all other characteristics strictly comply with SMACNA standards. The duct joints only will be permitted to vary from SMACNA standards.

# 2.4 DUCTWORK ACCESSORIES

- A. General: Unless otherwise indicated, all duct accessories shall be manufactured of the same materials as the surrounding ductwork, and shall be designed for the same pressure rating and application. All duct accessories shall be manufactured in accordance with SMACNA HVAC Duct Construction Standards unless otherwise specified herein.
- B. Manual Balancing Devices: Furnish and install all manual balancing devices, as shown on the drawings or required to properly distribute the air. Unless noted otherwise on the drawings, all manual balancing dampers in ducts with area greater than one square foot shall be the multiple opposed blade type. Balancing dampers in ducts one square foot and

smaller may be of a single blade, minimum 18 gage galvanized steel or, duct gage, whichever is heavier.

- 1. All accessible manual balancing devices shall be controlled by one of the following:
  - a. Chrome plated locking nut operators similar to Ventfabrics No. 688.
  - b. Self-locking lever operators similar to Ventfabrics No. 641.
  - c. Locking quadrant operators similar to Ventfabrics Nos. 555 and 560.
- 2. All inaccessible manual balancing devices shall be controlled by chrome plated locking nut operators similar to Ventfabrics No. 688 with top bearings and/or gear drives required for the remote installation of the regulator.
- C. IRIS Dampers: Iris dampers shall be model IRIS, as manufactured by Continental Fan Manufacturing Inc., of Buffalo, NY, and of the size as indicated on the drawings. Iris dampers shall be manufactured of hot dipped galvanized 22 gage steel for dampers installed in galvanized ductwork and shall be fabricated of 22 gauge 304 stainless steel for dampers installed in laboratory exhaust air ductwork. Duct connections shall be gasketed and beaded to provide for a sealed duct connection. Airflow measurement taps shall be provided with airflow adjustment charts located on the damper for convenient airflow measurement and control. Damper shall be capable of controlling airflow to +/- 7% of design airflow with a minimum of one duct diameter straight duct leading into the unit. Damper position shall be set with the factory supplied spanner wrench, with no zero calibration required. Dampers requiring zero calibration are not acceptable. Casing leakage to the environment shall not exceed 6 cfm.
- D. Access Doors: Furnish and install access doors in sheet metal ductwork of size and type as shown on the drawings. Access doors to be factory insulated for insulated ductwork. Access doors shall have flush frames for uninsulated or lined ductwork and shall have extended frames for externally insulated ductwork equal to insulation thickness. All access doors larger than 12" in any dimension shall be hinged, except where obstructed by other services or ceilings. Other access doors shall be cam lock type. All access doors must be fitted for airtight closure and shall be easily opened and closed.
  - 1. Access doors downstream of fire or smoke dampers shall be of the negative pressure relief type.
  - 2. Provide access door vision view port for viewing into duct with door closed.
- E. Turning Vanes:
  - 1. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".
- F. Flexible Connections: Provide flexible duct connections where shown on the Drawings, and wherever ductwork connects to vibration isolated equipment. Construct flexible connections of flameproof fabric crimped into duct stripes or flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment. Metal connection material to match duct material.
  - 1. Conventional indoor flexible connections to be glass fabric double coated with polychloroprene, suitable for temperatures from -10 to +200 deg F.

2. Outdoor flexible connections to be glass fabric coated with DuPont hypalon or other synthetic. Rubber waterproof coating resistant to the sun's ultraviolet rays and ozone environment, suitable for temperatures from -10 to +250 deg F.

## 2.5 AIR DIFFUSERS, REGISTERS AND GRILLES

- A. General: Except as otherwise indicated, provide manufacturer's standard air diffusers, registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide air diffusers, registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data and as scheduled on the drawings.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- D. Appearance: Diffusers, registers, and grilles which are not similar in appearance to model numbers specified will be rejected.
- E. Manufacturer: Subject to compliance with requirements, provide diffusers, registers and grilles of one of the following:

Krueger Mfg. Co. Price Co. Titus Products Div.; Phillips Industries, Inc.

# PART 3 - EXECUTION

- 3.1 INSPECTION
  - A. General: Examine areas and conditions under which metal ductwork and accessories are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
  - B. Drawings show the general layout of ductwork and accessories, but do not necessarily show all required fittings and offsets that may be necessary to connect ducts to equipment, terminal units, diffusers, etc. and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grids where applicable. Duct sizes on drawings are external sizes which shall be altered by contractor (with approval of Engineer) to other dimensions with the same or better area and friction characteristics where necessary to avoid interferences and clearance difficulties.

## 3.2 INSTALLATION OF METAL DUCTWORK

- A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (2% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Construct and install each duct system for the specific duct pressure classification indicated. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at a maximum interval of 16 feet, and at every floor.
- B. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceiling and lighting layouts and similar finished work.
- C. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and other electrical equipment spaces and enclosures unless ductwork serves these areas.
- D. Penetrations: See Section 230505 regarding duct penetrations. Where ducts penetrate interior and exterior walls and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on four sides by at least 1-1/2 inches.
- E. Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment controls and other associated work of ductwork system.
- F. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards, unless requirements are exceeded in this specification.

# 3.3 SEALING OF DUCTWORK

- A. General: Apply duct sealant to joints in accordance with SMACNA HVAC Duct Construction Standard and where indicated herein.
- B. Seal non-welded seams and joints as follows:
  - 1. Duct Pressure Class From -4" W.C. to +6" W.C.: Seal all transverse joints and longitudinal seams. Sealant may be omitted from longitudinal seams of supply ductwork downstream of terminal units when the total length of the duct run from the terminal unit is less than 20 feet.
  - 2. All Other Ductwork: Seal all transverse joints, longitudinal seams and duct penetrations.

- C. Seal externally insulated ducts prior to insulation installation.
- D. Seal ductwork prior to start-up of fans, per sealant manufacturer's recommendations. Ventilate areas as required to prevent build up of sealant odors in occupied spaces.

### 3.4 INSTALLATION OF FLEXIBLE DUCTS

- A. Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible".
- B. Unless otherwise noted on the Drawings, the last 10" to 24" connection to each high velocity and/or variable air volume terminal box and vertical drops from rectangular supply duct to round necked diffusers shall be made of flexible duct with exterior fiberglass insulation. The insulating ends of all flexible ductwork connections shall be clamped, then sealed with duct tape.
- C. Flexible ducts shall not penetrate any walls or partitions, this includes fire or smoke barrier which is required to have a fire resistance rating of one hour or more.

#### 3.5 FACTORY-FABRICATED DUCTWORK

A. Install in accordance with SMACNA HVAC Duct Construction Standards, and in compliance with manufacturer's recommendations.

### 3.6 INSTALLATION OF DUCTWORK ACCESSORIES

- A. General: Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Manual Balancing Devices: Install manual balancing devices where indicated on the drawings or as required to provide adequate means of adjusting air flow.
  - 1. Regulators: Install regulators on all manual balancing devices. If ductwork is accessible, mount the regulator on the ductwork. If ductwork will be inaccessible after the installation of the ceiling or walls, regulators shall be mounted in a steel, flush mounted box specifically designed for this purpose. Provide all linkage, top bearings and/or gear drives required for the remote installation of the regulator.
- C. Temperature Control Dampers: Install all temperature control dampers where indicated on the drawings unless factory installed in air handling equipment.
  - 1. Provide necessary transitions required to install dampers larger than duct size. Do not install control dampers smaller than duct size.
  - 2. Assemble multiple section dampers with required interconnecting linkage and extend required number of shafts through duct for external mounting of damper motors.
  - 3. See drawings for furnishing recommendation for temperature control dampers.
- D. Turning Vanes: Install turning vanes in square or rectangular 90 degree elbows in supply air, return air and exhaust air systems, and elsewhere as indicated.

- E. Flexible Connections: Connect metal ductwork to equipment as indicated. Provide flexible connection for each ductwork connection to equipment mounted on vibration isolators and/or equipment containing rotating machinery, and elsewhere as indicated.
- F. Coordination: Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

### 3.7 INSTALLATION OF AIR DIFFUSERS, REGISTERS AND GRILLES

- A. General: Install air diffusers, registers and grilles in ceilings where indicated in accordance with manufactures instructions and recognized industry practices to insure that products serve intended purpose.
- B. Location: Locate air diffusers, registers and grilles as indicated on architectural "Reflected Ceiling Plans". Unless otherwise indicated, locate units in the center of acoustical ceiling tiles.
- C. Coordination: Coordinate installation of air diffusers, registers and grilles with other trades installing devices in the ceiling.

# 3.8 DUCTWORK IDENTIFICATION

- A. Provide duct labeling and flow arrows for all ducts in shafts and on all duct mains handling 5,000 cfm or greater.
- B. Access Doors: Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.
- C. Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.

## 3.9 ADJUSTING AND CLEANING

- A. General: This contractor shall clean all duct systems in their entirety after they have been installed totally, but before their associated HVAC system has been started or commissioned. Clean ductwork internally of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration. Clean factoryfinished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint. This contractor shall provide written certification that all duct systems have been cleaned.
- B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.
- C. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

- D. Balancing: Refer to Division-23 section "Testing, Adjusting, and Balancing for HVAC" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process. Coordinate with Balance Contractor in pressure testing of ductwork where specified. Compensate Balance Contractor for retesting ductwork when ductwork fails initial pressure test.
- E. Contractor must be NADCA certified and incorporate NADCA Standard ACR2006 for all work performed.

## 3.10 INSPECTION

A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.11 FIELD QUALITY CONTROL

- A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak-proof performance.
- B. Seal all visible openings in ducts. Particularly at notches on rectangular duct joints. Seal air leaks audible at system operating conditions.

END OF SECTION 233113

## SECTION 238158 - VARIABLE REFRIGERANT FLOW SYSTEM

### 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. Requirements of the following Division 23 sections apply to this section: "Hangers, Supports and Anchors" "Vibration Controls" "Refrigerant Piping"

#### 1.2 SUMMARY

- A. This Section includes Inverter-based R-410A Refrigerant-based A. C. & Heat Pump Systems Indoor Direct Expansion Fan Coil Units and Outdoor Air-cooled Condensing Units with engineered piping/wiring for Variable Refrigerant Volume/Flow.
  - 1. System design includes simultaneous Heat & Cool Operation (Heat Recovery).
- B. Control System ITouch Manager to serve entire VRV system, Make-up air unit and relief fan. See drawings for panel location.
- 1.3 SUBMITTALS BASIS OF DESIGN MANUFACTERER
  - A. The basis of design manufacturer is Daiken Variable Refrigerant Volume Series (Heat & Cool) Split Systems as specified.
- 1.4 ACCEPTABLE MANUFACTERES (IN ADDITION TO BASIS OF DESIGN)
  - A. Provide Daikin or Mitsubishi Variable Refrigerant Flow System. The Daikin or Mitsubishi system shall match the basis of design system's cooling /heating capacity, controllability and other requirements outlined on construction documents.
  - B. A complete flow diagram of Sanyo or Mitsubishi system, including all system components and sizes of pipes, shall be submitted to the Engineer for review/approval during the Bid Phase. This information shall be submitted to the Engineer no less than 10 days prior to bid date to allow for adequate time for review.
  - C. Mechanical contractor shall coordinate with electrical contractor for any power requirement different with Daiken system.
  - D. Due to the differences in the Sanyo, Daikin, and Mitsubishi VRF systems and the specified system, electrical changes will be necessary. Currently, the extent of these changes is only known by the alternative system manufacturer. The cost of all electrical changes including design are to be included in the price by the mechanical contractor. The price should include electrical drawings in the same autocad format as the design drawings. Drawings to be prepared during the shop drawing phase for distribution to construction team.

## 1.5 SUBMITTALS

- A. Product Data: For each Variable Refrigerant Volume/Flow system, include documentation for rated capacities, operating characteristics, acoustic performance, furnished specialties, and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.
- B. Piping Diagrams: Manufacturer to layout and size refrigerant piping between each component of system. Provide sizing diagrams for review prior to installation by factory-trained refrigerant piping technicians.
- C. Wiring Diagrams: Manufacturer to layout and size power, signal & control wiring between each component of system. Provide sizing diagrams for review prior to installation by factory trained refrigerant piping technicians/electrical contractor.
- D. Startup Personnel Certification: Provide evidence of factory training of each Refrigeration Technician scheduled to be utilized in installation/startup/commissioning of variable refrigerant volume systems.
- E. Operation and Maintenance Data: For Variable Refrigerant Volume/flow system to include in emergency, operation, and maintenance manuals.
  - 1. Include a SPECIFIC Summary of required maintenance items for each unit, complete with pertinent part numbers and frequency of actions recommended.
- F. Warranty: Special warranty specified in this Section.

#### 1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of Variable Refrigerant Volume/Flow systems and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Performance Ratings: Certify published performance of Variable Refrigerant Volume/Flow A. C. & Heat Pump units according to current applicable standard covering Refrigerant System Heat Pumps.
- C. Electrical Components, Devices, and Accessories: ETL Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Fabricate and install refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

## 1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases as required by manufacturer. Concrete, reinforcement, and formwork requirements are specified in General Trades Division specifications.

- B. Coordinate size and location of equipment rack supports for stacked-configuration indoor condensing units. General miscellaneous steel components and fabrication specifications are located in general trades sections.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in General Trades Division specifications.
- D. Coordinate location of piping and electrical rough-ins.
- 1.8 PRE-COMMISSIONING CRITERIA
  - A. Coordinate layout and installation of VRV air terminal units and suspension systems with other construction elements that penetrate ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### 1.9 WARRANTY

- A. Unit warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of Variable Refrigerant Volume/Flow equipment that fails in materials or workmanship. Submit a written warranty signed by the Variable Refrigerant Volume/Flow system manufacturer and installer agreeing to furnish labor and parts for failures within a warranty period of one (1) year from the date of substantial completion/documented Start-up.
- B. Compressor warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace compressor(s) that fail in materials or workmanship. Submit a written warranty signed by the Variable Refrigerant Volume/Flow system manufacturer and installer agreeing to furnish parts and labor for compressor failures within a warranty period of six (6) years from the date of substantial completion.

### PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide Air-Cooled VRV Systems/products by one of the manufacturers specified:
  - 1. Daikin AC "VRV".
  - 2. Mitsubishi "City Multi"
  - 3. Sanyo "Eco-l"
- 2.2 CONTROLS
  - A. Room Controllers:
    - 1. Each indoor unit shall be provided with a Navigation room controller to provide individual zone control. The unit shall include 7-day programmable scheduling, automatic cooling/heating changeover for heat pump system, and temperature set-point range restrictions. The controller shall have an LCD digital display.
  - B. Building Management System:

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1. Building management system shall be capable of creating groups allowing for individual temperature monitoring and averaging for changeover of branch selector boxes to meet temperature setpoint. System shall be similar to web-enabled "Daiken Intelligent Touch Manager".

# 2.3 EVAPORATOR-FAN COMPONENTS

- A. General:
  - 1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes will be charged with dry air instead of R-410A before shipment from the factory.
- B. Unit Cabinet:
  - 1. The casing shall have a white finish.
  - 2. The rear cabinet panel shall have provisions for a field installed filtered outside air intake.
- C. Fan:
  - 1. The evaporator fan shall be high performance, double inlet, forward curve sirocco fans driven by a single motor.
  - 2. The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
  - 3. A motorized air sweep flow louver shall provide an automatic change in airflow by directing the air from side to side for uniform air distribution.
  - 4. The indoor fan shall consist of two (2) speeds, High and Low.
  - 5. There should be a choice of airflow outlets, a horizontal one and a downwardpointing one. Auto-angle vanes can be used independently by means of microprocessor control.
  - 6. Four directions of airflow can be selected by remote control. 100% downward flow, 80% downward flow (plus 20% horizontal airflow), 60% downward airflow (plus 40% horizontal airflow) and 100% horizontal airflow.
  - 7. Swing Flow Louvers automatically change the airflow direction.
- D. Filter:
  - 1. Return air shall be filtered by means of a long-life filter to provide approximately 2,500 hours of use in a normal office environment before cleaning.
- E. Coil:
  - 1. The evaporator coil shall be of nonferrous construction with smooth plate fins on copper tubing.
  - 2. The tubing shall have inner grooves for high efficiency heat exchange.
  - 3. All tube joints shall be brazed with phoscopper or silver alloy.
  - 4. The coils shall be pressure tested at the factory.
  - 5. A condensate pump shall be provided integral to the unit.

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6. A condensate pan and drain shall be provided under the coil.

# 2.4 BSQ BRANCH SELECTOR BOX FOR VRV HEAT RECOVERY SYSTEM

- A. General:
  - 1. The selector boxes shall be factory assembled, wired, and piped.
  - 2. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of rated capacity.
  - 3. The BSQ branch controllers must be run tested at the factory.
  - 4. The selector boxes must be mounted indoors.
  - 5. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling solenoid valve.
- B. Unit Cabinet:
  - 1. These units shall have a galvanized steel plate casing.
  - 2. Each cabinet shall house multiple refrigeration control valves and a liquid gas separator.
  - 3. The cabinet shall contain a tube in tube heat exchanger.
  - 4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
- C. Electrical:
  - 1. The control voltage between the indoor and outdoor unit shall be 16VDC nonshielded 2 conductor cable. These units shall have a galvanized steel plate casing.
- 2.5 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS
  - A. General:
    - 1. The outdoor unit is designed specifically for use with VRV series components.
    - 2. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receivers and accumulators. High/low pressure gas line, liquid and suction lines must be individually insulated between the outdoor and indoor units.
    - 3. The outdoor unit can be wired and piped with outdoor unit access from the left, right, rear or bottom.
    - 4. The connection ratio of indoor units to outdoor unit shall be permitted up to 130%.
    - 5. Each outdoor system shall be able to support the connection of up to 24 indoor units dependant on the model of the outdoor unit.
    - 6. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The outdoor unit shall be capable of operating automatically at further reduced noise during night time.
- 7. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
- 8. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
- 9. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
- 10. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.
- 11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
- 12. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
- B. Unit Cabinet:
  - 1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Fan:
  - 1. The condensing unit shall consist of one or more propeller type, direct-drive 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
  - 2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.24 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
  - 3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 7,400 CFM.
  - 4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
  - 5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
  - 6. The outdoor unit shall be capable of operating at further reduced sound levels during night time.
- D. Condenser Coil:
  - 1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
  - 2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
  - 3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.

- 4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
- 5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
- E. Compressor:
  - 1. The Daikin inverter scroll compressors shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
  - 2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "F-type" with a maximum speed of 6,480 rpm.
  - 3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
  - 4. The capacity control range shall be 7% to 100%.
  - 5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
  - 6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
  - 7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
  - 8. The compressor shall be spring mounted to avoid the transmission of vibration.
  - 9. Units sized 6 and 8 ton shall contain a minimum of 2 compressors, 12-16 ton units shall contain a minimum of 4 compressors. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
  - 10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle or every 8 hours.
- F. Electrical:
  - 1. The control voltage between the indoor and outdoor unit shall be 16VDC nonshielded, stranded 2 conductor cable.
  - 2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one outdoor unit with one 2-cable wire, thus simplifying the wiring operation.
  - 3. The control wiring lengths shall be as shown below.

## PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounting compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install and connect precharged refrigerant piping to component's quick-connect fittings. Install piping to allow access to unit.

#### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Ground equipment according to Division 16 Section "Grounding and Bonding."
- D. Electrical Connections: Comply with requirements in Division 16 Sections for power wiring, switches, and motor controls.

## 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

#### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

# 3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Closeout Procedures

END OF SECTION 238158

# SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

# PART 1 - GENERAL REFERENCE AND 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. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.
- C. Refer to Division 01 section "Alternates" for possible alternates affecting the extent of this section of work.
- D. This Contractor is also referred to the Architectural, Structural, Mechanical and all other drawings and specification pertinent to this project. All of the above-mentioned drawings and specifications are considered a part of the Contract Documents.
- E. This section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 01.

#### 1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:
  - 1. Shop Drawings
  - 2. Definitions
  - 3. Discrepancies
  - 4. Record drawings
  - 5. Equipment
  - 6. Substitutions
  - 7. Codes and permits
  - 8. Coordination
  - 9. Interferences
  - 10. Delivery, storage and handling
  - 11. Punchlists
  - 12. Operating and maintenance
  - 13. Warranties
- B. Related Secstions: The following sections contain requirements that relate to this Sections:
  - 1. Division 23 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT", for factory-installed motors, controllers, accessories, and connections.
  - 2. Division 26 Section "COMMON ELECTRICAL MATERIALS AND METHODS", for materials and methods common to the remainder of Division 26.

## 1.3 SHOP DRAWINGS

A. Product Data: Submit manufacturer's technical product data, including the recommended installation method, all in accordance with Division 01 and Section 26 requirements.

## 1.4 DEFINITIONS

- A. To achieve brevity in Specification and on Drawings, certain words and phases not contributing to clarity have been omitted. Unless mentioned specifically as work to be done by Other Trades, all requirements contained in the Specifications and shown on the Drawings shall be performed by the Principal Contractor for this Division of the Contract. The following definitions shall apply:
  - 1. Where the work "provide" is used in connection with a system, equipment, or time, it shall be construed to mean the furnishing and installing of the system, equipment or item.
  - 2. Where the phrases "as directed" is used it shall be construed to mean as directed by the Architect or their authorized representative.
- B. The term "Contractor" as applied to work specified, shown or reasonably implied in the contract documents for Division 26 shall be defined as the subcontractor who is responsible for the work specified or indicated. All subcontracted work must be incorporated by and coordinated by the Prime Contractor.

## 1.5 DISCREPANCIES

- A. Should it appear that there is a discrepancy between or within the drawings and/or specifications concerning the nature, quality or extent of materials or work to be furnished and/or installed, and such discrepancy is not clarified by Addendum during the bidding period, this Contractor shall base his bid on performing the work in the manner having the higher cost. The Architect shall have the option of selecting either of the manners shown and/or specified. In the event the lower cost manner is selected, a credit shall be due the Owner in the amount of the difference between the lower cost and higher cost manner. All discrepancies shall be called to the attention of the Architect before proceeding with work affected thereby.
- B. Should it appear that there is a duplication on the Drawings or in the Specifications, wherein the same work or items are shown or specified as being provided under different contracts, subcontracts or supply orders, and such duplication is not clarified by Addendum during the bidding period, it shall be assumed that the prime contractors have included duplicate quotations in their proposal to the Owner. The Architect shall have the option of selecting the contract, subcontract or supply order under which the work or items are to be provided and a credit shall be due the Owner for the duplicate work or items.
- C. The design drawings, as submitted, are diagrammatic and are not intended to show exact location of equipment, electrical devices, etc. unless dimensions are given. Drawings are not to be scaled.
  - 1. Equipment shall be installed along the general arrangement indicated on the drawings, and in accordance with the manufacturer's instructions.

- a. Provide at least the minimum manufacturer's recommended and code required clearance around the equipment for normal maintenance.
- b. Locate and arrange equipment in relationship to other system components to assure that the equipment will be operating under the best possible conditions to meet the scheduled performance requirements.
- 2. Raceways are to be installed along the general plans shown on the drawings keeping in mind the constraints of the available space and the need to coordinate with the work of other trades. Additional bends, pull and splice boxes shall be provided as necessary to meet space constraints and to facilitate the work of other trades.
- D. Electrical equipment, specified hereinafter or as shown on the drawings shall be furnished and installed by this Contractor, unless specifically indicated to the contrary.
- E. Occasionally, certain references may be indicated on the drawings to items which are suggested to be furnished and/or installed by various subcontractors. This is done to assist the applicable Prime Contractor in organizing his subcontractor's bids. However, no attempt has been made, nor is it implied, that this specification or plans are attempting to specifically divide all responsibilities for subcontractors. It is the Prime Contractor's responsibility that all items covered on electrical plans and Division 26 specifications are included in his bid and are coordinated with his subcontractors. No consideration will be given for Prime Contractor's failure to include all applicable electrical work in his bid.
- F. Where more than one manufacturer is named for major items of equipment, the manufacturer noted on the Drawings has been used as a basis for design. If another manufacturer is used, other than the one named on the Drawings, it shall be the responsibility of this contractor to ensure that the equipment will fit the space with all legal clearances, or bear the expense to change the space and structure to accommodate equipment used.

# 1.6 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements of this division, and in Division 01.

# 1.7 EQUIPMENT

- A. Before entering into a contract, the successful bidder may be required to submit satisfactory evidence to show that an equipment manufacturer has been regularly engaged in the manufacturing of such equipment for three (3) years and have not less than three (3) installations of a similar type which have been in successful operation under conditions similar to those specified for not less than two (2) years.
- B. When two or more items of same equipment are required (panelboards, switchboards, transformers, etc.) they shall be of the same manufacturer.

## 1.8 SUBSTITUTIONS

A. Refer to the Instructions to Bidders and the related Division 01 sections for requirements in selecting products and requesting substitutions.

## 1.9 CODE AND PERMITS

- A. All equipment, materials and installation shall comply with the National Fire Protection Association's "National Fire Codes" and "National Electrical Code". Equipment shall bear the "UL" label as required by these codes.
- B. Install work in full accordance with rules and regulations of State, County and City authorities having jurisdiction over premises. This shall include safety requirements of Ohio State Department of Industrial Relations. Do not construe this as relieving Contractor from compliance with any requirements of specification which are in excess of Code requirements and not in conflict therewith.
- C. Unless otherwise indicated, secure and pay for all permits and certificates of inspection incidental to this work required by foregoing authorities. Be responsible for payments to all public utilities for temporary service work performed by them in connection with provision of temporary service required under this Division of specifications. Deliver all certificated to Architect in duplicate.

## 1.10 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping.".
- E. Unless otherwise additionally required in "Project Coordination" sections, prepare and submit for approval coordination drawings drawn to readable scale of all areas where equipment or materials are being used which are not basis of specification and result in a change in the accessibility, performance, or serviceability of such equipment, or a conflict with other trades. Such equipment or materials shall not be installed until it receives approval form the Engineer.

# 1.11 INTERFERENCES

A. Before installing any work, this Contractor shall see that it does not interfere with clearance required for finish on beams, columns, pilasters, walls or other structural or architectural members, as shown on Architectural Drawings. If any work is so installed

and it later develops that Architectural design cannot be followed, Contractor shall, at his own expense, make such changes in his work as the Architect may direct to permit completion of Architectural work in accordance with plans and specifications.

- B. Install additional conduit, pullboxes, spliceboxes, etc. where required to obtain maximum headroom or to avoid conflict with other work without additional cost to the Owner. Where mounting heights are not detailed or dimensioned, install electrical conduit and overhead equipment to provide the maximum headroom possible.
- C. Report any interferences between work under this division and that of any other Contractors to the Architect as soon as they are discovered. The Architect will determine which equipment shall be relocated, regardless of which was first installed, and his decision shall be final.

## 1.12 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall make provisions for the delivery and safe storage of his materials and equipment in coordination with the work of others. Materials and equipment shall be delivered at such stages of the work as will expedite the work as a whole and shall be marked and stored in such a way as to be easily checked and inspected. The arrival and placing of large equipment items shall be scheduled early enough to permit entry and setting when there is no restriction or problem due to size and weight.

# 1.13 PUNCHLISTS

A. From time to time throughout the course of the work, or upon completion of the work the Engineer may perform site observations resulting in written documentation of deviations in the work from the Contract Documents. In such cases the Contractor shall respond in writing to each and every item on this written documentation stating the specific action taken to remedy the deviation. A response shall be provided by the Contractor for each separate observation. This work shall not be considered complete until such satisfactory written response is received by the Engineer. Contractor shall submit the responses to these items as part of the closeout documentation.

## 1.14 OPERATING AND MAINTENANCE

- A. This Contractor shall furnish competent personal instruction to the Owner's operating personnel for a period of hours as indicated in individual Division 26 specification sections in the proper operation of the electrical equipment. He shall also supply the Owner with one (1) hardbound copy and (1) electronic copy of an operation manual containing the following:
  - 1. Step-by-step procedures for start-up and operation for each system and piece of equipment.
  - 2. Performance data, curves, ratings.
  - 3. Wiring diagrams.
  - 4. Manufacturer's descriptive literature.
  - 5. Manufacturer's maintenance and service manuals.
  - 6. Spare parts and replacement parts list for each piece of equipment.
  - 7. Name of service agency and installer complete with an emergency service phone number for nights, weekends and holidays.
  - 8. Final approved shop drawings.

# 1.15 WARRANTIES

- A. Refer to Division 01 Section: Specific Warranties for procedures and submittal requirements for warranties. Refer to individual equipment specifications for additional warranty requirements.
- PART 2.- PRODUCTS (NOT APPLICABLE)
- PART 3.- EXECUTION (NOT APPLICABLE)

END OF SECTION 260500

# SECTION 260501 - COMMON ELECTRICAL MATERIALS AND METHODS

# 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 this Section.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

## 1.2 DESCRIPTION OF WORK

- A. Extent of electrical related work required by this section is indicated on drawings and/or specified in other Division 26 sections.
- B. See specification Division 09 for painting requirements. Coordinate all electrical painting work required. Coordinate protection requirements for electrical equipment which could be damaged by painting.
- C. Furnish and install all miscellaneous steel required for supports, hangers, anchors, etc., required for installation of equipment and materials furnished and installed under this Division. Steel used in a damp or wet environment shall be hot dipped galvanized unless otherwise noted.
- D. Furnish and install fire stopping for sealing around electrical penetrations through fire or smoke barriers, and floors.
- E. This Contractor shall perform all Division 26 related and indicated demolition including: Nondestructive removal of materials and equipment for re-use or salvage as indicated. All equipment removed shall be offered to the Owner for his retention. If the Owner elects to retain equipment, it shall be turned over to the Owner at the site. If not, the equipment shall be removed from the premises by this Contractor. Refer to Division 02 Section "Selective Demolition" for additional requirements.

### 1.3 SUMMARY

A. This section includes a limited scope of general construction materials and methods pertaining to Division 26 applications of the following items:

Miscellaneous Metal

Rough-ins

Electrical installations

Cutting and patching

Fire stopping

Selective demolition and alterations

- 1.4 PROJECT CONDITIONS
  - A. Conditions Affecting Demolition: The following project conditions apply:

- 1. Protect adjacent materials to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
- 2. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.
- B. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.
- C. Provide minimum of 14 working day notice to Architect, and receive written notice to proceed before interrupting any utility.

# 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including the recommended installation method, all in accordance with Division 01 and Section 260500 requirements.
- B. Electrical Penetration Seals: Submit the following:
  - 1. Shop drawings showing each condition requiring penetration seals. Indicate proposed UL systems materials, anchorage, methods of installation, and actual adjacent construction.
  - 2. A copy of UL illustration of each proposed system indicating manufacturer approved modifications.
  - 3. Manufacturer's specifications, recommendations, installation instructions and maintenance instructions.
- 1.6 SEQUENCE AND SCHEDULING
  - A. Coordinate the shut-off and disconnection of electrical service and/or power with the Owner. All associated work to be done at Owner's convenience.
  - B. Notify the Architect at least 5 working days prior to commencing demolition operations.
  - C. Perform demolition in phases as required by Architect.

# PART 2 PRODUCTS

# 2.1 MISCELLANEOUS METALS

- A. Fasteners: Zinc-coated, type, grade, and class as required.
- B. Metal Framing: As manufactured by Unistrut or Kindorf unless noted otherwise. Provide framing of sizes required by specific application.

# 2.2 FIRE STOPPING MATERIALS

A. Fire stopping materials shall be intumescent safety barriers designed to block the spread of fire and smoke through penetrations created by electrical installations in fire rated walls

and floors. Materials shall be flame, toxic fume and water resistant and shall have a minimum 3-hour fire rating. Fire rating shall be defined by tests conducted by ASTM, UL or other testing and inspection agencies acceptable to authorities having jurisdiction.

1. Acceptable Manufacturers:

Specified Technologies, Inc. (STI) Somerville, NJ Tremco, Inc. Beachwood, OH 3M Inc., Minneapolis, MN

- 2. Materials: a. Fires
  - Firestop Mortar: STI SpecSeal Mortar Tremco TREMstop-M 3M Fire Barrier Mortar
  - b. Intumescent Firestop Sealants and Caulks SpecSeal SSP Putty Tremco TREMstop-WBM 3M Fire Barrier CP-25 WB
  - c. Silicone Firestop Sealants Caulks STI SpecSeal Pensil 100 & 300 Tremco Fyre Sil Sealant 3M Fire Barrier 2000 & 2003
  - d. Firestop Putty: STI SpecSeal Firestop Putty Bars & Pads Tremco TREMstop FP Flowable Putty 3M Fire Barrier Firestop Putty
  - e. Firestop Collars: STI SpecSeal Firstop Collars Tremco TREMstop D Combustible Pipe Device 3M Fire Barrier Pipe Device
  - f. Wrap Strip:

STI Spec Seal Wrap Strip Tremco TREMstop-WS 3M Fire Barrier WS-195 Wrap Strip

B. Sleeves shall be Schedule 40, galvanized steel with plain end. Sleeves shall be no more than two sizes larger than single penetrating conduit. For multiple cable or conduit penetrations, make sleeve as small as possible to allow for penetrating items and firestopping material.

# PART 3 EXECUTION

# 3.1 EXAMINATION AND PROJECT CONDITIONS

- A. Examine area and conditions under which basic electric materials are to be installed or methods are to be performed and notify 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 Engineer.
- 3.2 ERECTION OF METAL SUPPORTS AND ANCHORAGE
  - A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

# 3.3 ROUGH-IN

- A. Verify with Architect prior to rough-in, exact location of items such as switches, receptacles, clocks, speakers, fire alarm devices, floor boxes, surface-mounted raceways, etc., in finished areas.
- B. Verify with respective equipment supplier prior to rough-in, exact location and method of connection to respective equipment for such items as mechanical equipment, etc.

## 3.4 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
  - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
  - 2. Verify all dimensions by field measurements.
  - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
  - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
  - 5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
  - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  - 7. Coordinate connection of electrical systems with exterior underground and/or overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  - 8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
  - 9. Install systems, materials, and equipment level and plumb, parallel, and perpendicular to other building systems and components.
  - 10. Equipment shall be installed along the general arrangement indicated on the drawings, and in accordance with the manufacturer's instruction.
    - a. Provide at least the minimum manufacturer's recommended and code required clearance around the equipment for normal maintenance.
    - b. Locate and arrange equipment in relationship to other system components to assure that the equipment will be operating under the best possible conditions to meet the scheduled performance requirements.
  - 11. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
  - 12. Provide access panel or doors where units are concealed behind finished surfaces such as drywall and/or plaster construction, etc. Coordinate the access panel type with the Architect.

- 13. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope (such as for underground services, etc.).
- 14. All wiring other than within an item of equipment, to be in raceways unless shown otherwise on Drawings or covered otherwise in these Specifications.
- 15. Raceways are to be installed along the general plans shown on the drawings keeping in mind the constraints of the available space and the need to coordinate with the work of other trades. Additional bends, pull and splice boxes shall be provided as necessary to meet space constraints and to facilitate the work of other trades.
- 16. Raceways, boxes, cables, conductors, etc., installed in plenum spaces and similar areas shall be supported from the building structure and shall be installed symmetrical with the axis of the space (do not cross room at an angle). Support wires for lay-in type grid ceilings shall not be used to support electrical equipment, raceways, cables, etc.
- 17. Wiring of Motors and/or Equipment:
  - a. Provide necessary power wiring to motors and/or equipment where shown on Drawings.
    - 1.) Make final "line" connections to respective items of equipment as shown on Drawings.
    - 2.) Provide "Control" wiring, regardless of voltage, only when shown on Electrical Drawings.
    - 3.) In general, all 120, 208, 240, 277, or 480 volt wiring to be construed as power wiring; however, line voltage control wiring shall not be construed as power wiring unless shown on Electrical Drawings.
- 18. Wiring of Heating, Ventilating, and Air Conditioning Equipment:
  - a. Provide power wiring as shown on Electrical Drawings. In general, this shall consist of power conductors and raceway up to and including connections to line terminals of respective items of equipment.
    - 1.) Where this Contractor furnishes motor starter and/or disconnect switch, this also shall include the power wiring between the load side of starter and/or disconnect switch and line terminals of respective item of equipment.
    - 2.) Where other Divisions furnish motor starter and/or disconnect switch (other than factory-mounted, prewired items), this Contractor shall provide power wiring as described in previous paragraph and shall mount respective starter and/or disconnect switch.
    - 3.) Where electric heating equipment is involved, wiring responsibilities to be as shown on Electrical Drawings.
    - 4.) Control wiring, regardless of voltage characteristics, is not to be construed as power wiring and is not the responsibility of this Contractor unless indicated as such on Electrical Drawings.

In certain cases, such as between a thermostat and a cabinet heater or a unit heater, or between a switch and a small exhaust fan, wiring may be required by this Contractor only if shown on Electrical Drawings.

5.) It shall be the responsibility of this Contractor, prior to roughin of conduits serving mechanical equipment, to verify with respective equipment supplier the required ampacity and quantity of conductors serving the equipment. In the event changes are required from those shown on the Drawings, this information shall be brought to the attention of the Engineer and authorization obtained from the Engineer in writing prior to proceeding with the necessary changes. Changes required shall be performed at the expense of the mechanical (HVAC or plumbing) contractor.

- 19. Temperature Control Wiring:
  - a. Temperature control wiring, regardless of voltage characteristics, is not the responsibility of this Contractor unless indicated as such on Electrical Drawings or herein described.
    - 1.) In general, the furnishing and installing of all temperature control devices and respective wiring shall be the responsibility of other Divisions.

# 3.5 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Section "CUTTING AND PATCHING". In addition to the requirements specified in Division 01, the following requirements apply:
  - 1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
    - a. Demolition of electrical items required to be removed from structure to remain.
    - b. Uncover work to provide for installation of ill-timed work.
    - c. Remove and replace defective work.
    - d. Remove and replace work not conforming to requirements of the Contract Documents.
    - e. Install equipment and materials in existing structures.
    - f. Upon written instructions from the Engineer, uncover and restore work to provide for Engineer observation of concealed work.
  - 2. Cut, remove, and legally dispose of electrical equipment, components, and materials, including but not limited to electrical items to be removed and items made obsolete by the new work.
  - 3. Protect the structure, furnishings, finishes, and adjacent materials not to be removed.
  - 4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
  - 5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
  - 6. Patch new and/or existing finished surfaces and building components using new materials matching existing materials and using workmen skilled in respective trade.
  - 7. Where existing construction such as floors, walls, ceilings, etc., must be cut to relocate, remove or add raceways and/or equipment, such construction to be restored to original condition to satisfaction of Architect by this Contractor using workmen skilled in respective trade.
  - 8. General penetrations through walls, floors, slab, etc. will be patched with materials to match the surrounding surface (i.e. vinyl concrete patch for concrete surfaces, joint

and patching compound for dry wall surfaces, etc.). If the penetrated surface is a fire or smoke barrier, refer to "Installation of Fire Stopping Materials" in this section.

# 3.6 INSTALLATION OF FIRE-STOPPING MATERIAL

- A. General:
  - 1. All fire and smoke rated walls and floors penetrated by electrical raceways, exposed conductors, etc. shall be properly sleeved and fire sealed. See Division 7 "Firestopping". All firestop system types shall be by same manufacturer to fullest extent possible.
  - 2. All fire stopping will be installed in accordance to the U.L. rated system designed for the application.
  - 3. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
  - 4. Grout, Mortar, or Gypsum products shall not be installed in lieu of firestopping material specified here.
- B. Sleeves:
  - 1. Wall and floor opening shall be made as small as possible. Install sleeves during the erection of concrete or masonary walls. Sleeve shall be grouted in using material to match surrounding surface. Install electrical raceway, exposed conductors, etc. through sleeve and install fire stopping, intumescent material.
- C. Penetrations Provide Firestopping:
  - 1. Where penetrations including conduit, cable, wire, or other elements which pass through one or both outer surfaces of a fire rated floor or wall.
  - 2. Except for floor on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof.
  - 3. Where a penetration occurs through fire-rated walls, or partitions of hollow-type construction, provide fire stopping to completely fill spaces around the penetration, on each side of the wall or partition.
  - 4. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, fire stop annular space, if any, between sleeve and wall opening.
- D. Provide fire stopping to fill miscellaneous voids and blank openings in fire-rated construction where conduit, cable, wire or equipment has been removed.
- 3.7 SELECTIVE DEMOLITION AND ALTERATION OF EXISTING ELECTRICAL SYSTEMS
  - A. Demolition Definitions:
    - 1. Under demolition notes, several words and phrases are used. These shall be interpreted to mean as follows:
      - a. Abandon: Disconnect designated equipment and remove respective conductors back to source, such as a panelboard, distribution panel, switchboard, switchgear, etc. Alter respective legend accordingly.

- b. Disconnect: Disconnect designated equipment and remove respective branch circuit wiring and affected exposed electrical equipment, such as boxes, raceways, control, etc.
  - 1.) Remove conductors back to source such as panelboard, etc. Alter respective legend accordingly.
  - 2.) Remove exposed raceway. When in unfinished areas such as mechanical equipment rooms, remove back to source. When in finished spaces, remove only that raceway which is exposed.
  - 3.) Where raceway is above an existing suspended, accessible ceiling and that ceiling grid is being reused or replaced, remove the exposed raceway in the affected area. Concealed homeruns are to remain and may be reused at Contractor's option.
- c. Disconnect and Reconnect: Disconnect designated items, remove and store same where necessary, and then reinstall item and reconnect to existing branch circuit and control.
- d. Remove Branch Circuit and/or Feeder: Remove conductor and respective raceway, fittings, boxes, etc.
- B. Where existing building construction is to be altered to accommodate the planned renovations and/or an addition(s), alter existing electrical service and distribution system, communications systems, fire alarm system, etc., as shown on the drawings and as required for proper operation of the altered system.
- C. Where existing accessible ceiling grid panels and grid support members are removed to permit the installation of new conduit, boxes, etc., it shall be the responsibility of this Contractor to reinstall the panels and grid support system to the satisfaction of the Architect. Damaged items shall be replaced at no cost to the Owner.
- D. Remove all existing affected electrical equipment, devices, fixtures, boxes, etc. which are not incorporated into or are not necessary for the operation of new and/or existing electrical systems, making sure that no remaining fixtures, devices, or appliances are left without service.
- E. Make sure that no remaining fixtures, devices, etc. within the renovated area or adjacent areas are left without service.
  - 1. Services and/or power outages and cutovers to be coordinated Engineer and Owner and done at Owner's convenience.
  - 2. Modify existing "systems" as required to accommodate added equipment.
  - 3. Remove abandoned accessible surface-mounted boxes and raceway. Abandoned accessible surface raceway shall be removed complete back to source.
  - 4. Where an abandoned raceway penetrates floor, slab, wall, etc. raceway shall be cut below the surface. Seal the opening and restore respective surface to match surrounding surface as directed.
  - 5. Where an abandoned raceway is not accessible, the raceway shall remain. Any accessible portions penetrating out of wall, floor, slab, etc. shall be cut off below the surface. Seal the opening and restore the respective surface to match the surrounding surface as directed.

- a. Perform cutting and patching required for demolition in accordance with Division 01 and Division 02 section "Cutting and Patching".
- 6. Flush mounted outlet boxes which are abandoned or used for junction boxes and are not concealed by new construction shall have openings covered by a blank, stainless steel plate.
- 7. Where an existing distribution center is altered, provide a new, accurate, typed legend.
- 8. Where work cannot be executed during normal working hours, this Contractor shall include in the Base Bid all necessary overtime pay to execute this contractors contract.
- F. All electrical equipment removed and not scheduled for reuse shall be turned over to the Owner at the construction site for salvage. All items deemed not salvageable by the Owner shall become the property of this Contractor and shall be removed from the site within 72 hours.

END OF SECTION 260501

# 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Metal-clad cable, Type MC, rated 600 V or less.
  - 3. Connectors, splices, and terminations rated 600 V and less.

### 1.3 DEFINITIONS

- A. RoHS: Restriction of Hazardous Substances.
- B. VFC: Variable-frequency controller.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- 1.5 QUALITY ASSURANCE
  - A. Testing Agency Qualifications: Member company of NETA.
    - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

# PART 2 - PRODUCTS

- 2.1 COPPER BUILDING WIRE
  - A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpha Wire Company.
  - 2. American Bare Conductor.
  - 3. Belden Inc.
  - 4. Cerro Wire LLC.
  - 5. Encore Wire Corporation.
  - 6. General Cable Technologies Corporation.
  - 7. Okonite Company (The).
  - 8. Service Wire Co.
  - 9. Southwire Company.
  - 10. WESCO.
  - 11. West Penn.
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type THHN and Type THWN-2: Comply with UL 83.
- 2.2 METAL-CLAD CABLE, TYPE MC
  - A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath in 6' length or less from J-box to lighting fixture or as approved by the Project Manager.
  - B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. AFC Cable Systems; a part of Atkore International.
    - 2. Alpha Wire Company.
    - 3. American Bare Conductor.
    - 4. Belden Inc.
    - 5. Encore Wire Corporation.
    - 6. General Cable Technologies Corporation.
    - 7. Okonite Company (The).
    - 8. Service Wire Co.
    - 9. Southwire Company.
    - 10. WESCO.
  - C. Standards:

WEST VIRGINIA LOTTERY TEST LAB RENOVATIONS LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- 2. Comply with UL 1569.
- 3. RoHS compliant.
- 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
  - 1. Single circuit and multicircuit with color-coded conductors.
- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- F. Ground Conductor: Insulated.
- G. Conductor Insulation:
  - 1. Type THHN/THWN-2: Comply with UL 83.
- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.
- 2.3 CONNECTORS AND SPLICES
  - A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - B. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - 1. 3M Electrical Products.
    - 2. AFC Cable Systems; a part of Atkore International.
    - 3. Gardner Bender.
    - 4. Hubbell Power Systems, Inc.
    - 5. Ideal Industries, Inc.
    - 6. ILSCO.
    - 7. NSi Industries LLC.
    - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - 9. Service Wire Co.
    - 10. TE Connectivity Ltd.
    - 11. Thomas & Betts Corporation; A Member of the ABB Group.
  - C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
  - D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

WEST VIRGINIA LOTTERY	LOW-VOLTAGE ELECTRICAL
TEST LAB RENOVATIONS	POWER CONDUCTORS AND
	CABLES

- 1. Material: Copper.
- 2. Type: One hole with standard barrels.
- 3. Termination: Crimp.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders and Branch Circuits: Copper; solid for No. 14 AWG and smaller; stranded for No. 12 AWG and larger.
- 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS
  - A. All Wiring: Type THHN/THWN-2, single conductors in raceway.
  - B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

#### 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 12 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 tests and inspections.
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. Perform each of the following tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Inspect compression-applied connectors for correct cable match and indentation.
    - c. Inspect for correct identification.
    - d. Inspect cable jacket and condition.

B. 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

#### 1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

#### 1.3 SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Ground rods.
  - 2. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

#### 1.4 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 017823 "Operation and Maintenance Data," include the following:
    - a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
      - 1) Ground rods.
      - 2) Grounding arrangements and connections for separately derived systems.

## 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

# PART 2 - PRODUCTS

# 2.1 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.

## 2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advanced Lightning Technology, Ltd.
  - 2. Burndy; Part of Hubbell Electrical Systems.
  - 3. Dossert; AFL Telecommunications LLC.
  - 4. ERICO; a brand of nVent.
  - 5. Fushi Copperweld Inc.
  - 6. Galvan Industries, Inc.; Electrical Products Division, LLC.
  - 7. Harger Lightning & Grounding.
  - 8. ILSCO.
  - 9. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 10. Robbins Lightning, Inc.
  - 11. Siemens Industry, Inc., Energy Management Division.
  - 12. Thomas & Betts Corporation; A Member of the ABB Group.

#### 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. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 6. 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. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
  - C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
  - D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
  - E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
  - F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
  - G. Conduit Hubs: Mechanical type, terminal with threaded hub.
  - H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
  - I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
  - J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
  - K. Straps: Solid copper, copper lugs. Rated for 600 A.
  - L. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one twopiece clamp.
  - M. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
  - N. Water Pipe Clamps:
    - 1. Mechanical type, two pieces with zinc-plated bolts.
      - a. Material: Tin-plated aluminum.
      - b. Listed for direct burial.
    - 2. U-bolt type with malleable-iron clamp and copper ground connector.

## 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.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers.
- D. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Exothermic welded connectors as indicated.
  - 3. Connections to Structural Steel: Exothermic 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. Install grounding electrode(s) at the transformer location. The electrode shall be connected to the equipment grounding conductor and to the frame of the transformer.
- 3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS
  - A. Comply with IEEE C2 grounding requirements.
  - B. Pad-Mounted Transformers and Switches: Install four 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.

## 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.
- C. 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 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. Use exothermic welds for all below-grade connections.
  - 3. For grounding electrode system, install at least three rods spaced at least onerod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. 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.
- D. 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.
- E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

# 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor to engage a qualified third party 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. 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 groundresistance level is specified, at service disconnect enclosure grounding

terminal, at ground test wells. 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 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.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
  - 5. Substations and Pad-Mounted Equipment: 5 ohms.
- G. 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.
- 1.2 SUMMARY
  - A. Section Includes:
    - 1. Steel slotted support systems.
    - 2. Conduit and cable support devices.
    - 3. Support for conductors in vertical conduit.
    - 4. Structural steel for fabricated supports and restraints.
    - 5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
    - 6. Fabricated metal equipment support assemblies.
  - B. Related Requirements:
    - 1. Conduit supports on roof non-penetration product specifically designed for conduit support.
    - 2. Product shall be approved by roofing manufacturer to retain roofing warranty.

#### 1.3 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. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
    - d. Sockets.
    - e. Eye nuts.
    - f. Fasteners.
    - g. Anchors.
    - h. Saddles.

- i. Brackets.
- 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.
  - 1. Hangers. Include product data for components.
  - 2. Slotted support systems.
  - 3. Equipment supports.
- C. Welding certificates.
- 1.4 QUALITY ASSURANCE
  - A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- 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 Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

# 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. CADDY; a brand of nVent.
    - d. Flex-Strut Inc.
    - e. Gripple Inc.
    - f. GS Metals Corp.
    - g. G-Strut.
    - h. Haydon Corporation.
    - i. Metal Ties Innovation.

- j. MIRO Industries.
- k. Thomas & Betts Corporation; A Member of the ABB Group.
- I. Unistrut; Part of Atkore International.
- m. Wesanco, Inc.
- 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
- 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
- 4. Channel Width: 1-1/4 inches.
- 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
- 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored 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 made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. 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, provide products by one of 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, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) B-line, an Eaton business.
- 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 are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 6. Toggle Bolts: All Stainless-steel springhead type.
- 7. Hanger Rods: Threaded steel.

## 2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

## PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA 1.
  - 2. NECA 101
  - 3. NECA 102.
  - 4. NECA 105.
  - 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. 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 50 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

# 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. 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.
- C. 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. To Existing Concrete: Expansion anchor fasteners.
  - 5. 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.
  - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
  - 7. To Light Steel: Sheet metal screws.
  - 8. 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 comply with seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

# 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for sitefabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

## 3.4 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 099113 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" 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 - RACEWAYS 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal conduits and fittings.
  - 2. Metal wireways and auxiliary gutters.
  - 3. Boxes, enclosures, and cabinets.
- B. Related Requirements:
  - 1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.

### 1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

#### 1.4 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.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Adalet, Inc.
    - b. AFC Cable Systems; a part of Atkore International.
    - c. Allied Tube & Conduit; a part of Atkore International.
    - d. Amp.
    - e. Anamet Electrical, Inc.
    - f. Appleton Electric Co.
    - g. Arlington Industries Inc.
    - h. Calconduit.
    - i. Electri-Flex Company.
    - j. FSR Inc.
    - k. Hubbell, Inc.
    - I. Korkap.
    - m. NEC, Inc.
    - n. Opti-Com Manufacturing Network, Inc (OMNI).
    - o. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - p. Republic Conduit.
    - q. Southwire Company.
    - r. Thomas & Betts Corporation; A Member of the ABB Group.
    - s. Western Tube and Conduit Corporation.
    - t. Wheatland Tube Company.
  - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. GRC: Comply with ANSI C80.1 and UL 6.
  - 4. IMC: Comply with ANSI C80.6 and UL 1242.
  - 5. EMT: Comply with ANSI C80.3 and UL 797.
  - 6. FMC: Comply with UL 1; zinc-coated steel.
  - 7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Allied Tube & Conduit; a part of Atkore International.
    - c. Anamet Electrical, Inc.
    - d. Electri-Flex Company.
    - e. FSR Inc.
    - f. Korkap.

- g. NEC, Inc.
- h. NewBasis.
- i. Opti-Com Manufacturing Network, Inc (OMNI).
- j. O-Z/Gedney; a brand of Emerson Industrial Automation.
- k. Perma-Cote.
- I. Republic Conduit.
- m. Southwire Company.
- n. Thomas & Betts Corporation; A Member of the ABB Group.
- o. Western Tube and Conduit Corporation.
- p. Wheatland Tube Company.
- 2. Comply with NEMA FB 1 and UL 514B.
- 3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 4. Fittings, General: Listed and labeled for type of conduit, location, and use.
- 5. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
- 6. Fittings for EMT:
  - a. Material: Steel.
  - b. Type: Setscrew.
- C. Joint Compound for IMC, GRC: 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 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. B-line, an Eaton business.
  - 2. Hoffman; a brand of nVent.
  - 3. MonoSystems, Inc.
  - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 and/or Type 3R unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, 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.
- D. Wireway Covers: Hinged for type 3R, screw-cover for type 1 unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

## 2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Adalet.
  - 2. Crouse-Hinds, an Eaton business.
  - 3. EGS/Appleton Electric.
  - 4. Erickson Electrical Equipment Company.
  - 5. FSR Inc.
  - 6. Hoffman; a brand of nVent.
  - 7. Hubbell Incorporated.
  - 8. Hubbell Incorporated; Wiring Device-Kellems.
  - 9. Kraloy.
  - 10. Milbank Manufacturing Co.
  - 11. MonoSystems, Inc.
  - 12. Oldcastle Enclosure Solutions.
  - 13. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 14. Plasti-Bond.
  - 15. RACO; Hubbell.
  - 16. Spring City Electrical Manufacturing Company.
  - 17. Stahlin Non-Metallic Enclosures.
  - 18. Thomas & Betts Corporation; A Member of the ABB Group.
  - 19. Topaz Electric; a division of Topaz Lighting Corp.
  - 20. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- 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, ferrous alloy, Type FD, with gasketed cover.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep for power 5 inches square x 2-1/8" inches deep for telecom.

- J. Gangable boxes are allowed.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 and/or Type 3R 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: Plastic.
  - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- L. Cabinets:
  - 1. NEMA 250, Type 1 and/or Type 3R 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.

## PART 3 - EXECUTION

## 3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway 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: GRC. Raceway locations include the following:
    - 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 institutional and commercial kitchens and damp or wet locations.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways 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. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

## 3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hotwater pipes. Install horizontal raceway runs above water and steam piping.
- F. Complete raceway 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 three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction. Pull point shall be no more than 200 linear feet.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches of enclosures to which attached.
- L. Stub-Ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or GRC for raceways.
  - 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 raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

- O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- 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 and deburr. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- S. Install pull wires in empty raceways. 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. Cap underground raceways designated as spare above grade alongside raceways in use.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, 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 raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway 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 raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Conduit extending from interior to exterior of building.
  - 3. Where otherwise required by NFPA 70.
- V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches72 inches of flexible conduit for recessed and semirecessed luminaires, 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.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- W. 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 center of box unless otherwise indicated.
- X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- Y. Locate boxes so that cover or plate will not span different building finishes.

- Z. 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.
- AA. 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 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."

### 3.4 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 and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is 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.
  - 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 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.

- 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. Sleeves for Rectangular Openings:
  - 1. Material: Galvanized sheet steel.
  - 2. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
    - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

## 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, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. CALPICO, Inc.
    - c. Metraflex Company (The).
    - d. Pipeline Seal and Insulator, Inc.
    - e. Proco Products, Inc.
    - f. GPT, Link-Seal
  - 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 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in nonfire-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. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. 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 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 raceway or cable unless sleeve seal is to be installed.
  - 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.
- D. 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.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. 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.
- G. 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.

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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
  - 2. Labels.
  - 3. Bands and tubes.
  - 4. Tapes and stencils.
  - 5. Tags.
  - 6. Signs.
  - 7. Cable ties.
  - 8. Paint for identification.
  - 9. Fasteners for labels and signs.

### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- C. Dedicated-Design Submittal: For arc-flash hazard study.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME 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. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. 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. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on white field.
  - 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
  - 1. Color shall be factory applied.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
    - d. Neutral: White.
  - 3. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
    - d. Neutral: White.
  - 4. Color for Equipment Grounds: Green.

- C. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs 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."
- E. Equipment Identification Labels:
  - 1. Black letters on a white field.

### 2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weatherand chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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 shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
- 3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- C. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weatherand UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlton Industries, LP.
    - b. Champion America.
    - c. HellermannTyton.
    - d. Ideal Industries, Inc.
    - e. Marking Services, Inc.
    - f. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

WEST VIRGINIA LOTTERY TEST LAB RENOVATIONS

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Brady Corporation.
  - b. Carlton Industries, LP.
  - c. emedco.
  - d. Marking Services, Inc.
- C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and are 12 inches wide. Stop stripes at legends.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. HellermannTyton.
    - b. LEM Products Inc.
    - c. Marking Services, Inc.
    - d. Seton Identification Products.

## 2.5 TAGS

- A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. emedco.
    - d. Grafoplast Wire Markers.
    - e. LEM Products Inc.
    - f. Marking Services, Inc.
    - g. Panduit Corp.
    - h. Seton Identification Products.

### 2.6 SIGNS

- A. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. Emedco.
    - d. Marking Services, Inc.

- B. Engraved legends:
  - 1. Engraved legend with black letters on white face:
    - a. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
    - b. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
  - 2. 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.

### 2.7 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. HellermannTyton.
  - 2. Ideal Industries, Inc.
  - 3. Marking Services, Inc.
  - 4. Panduit Corp.
- B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and 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.

### 2.8 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 electrical 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 electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. 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, load shedding, etc.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- K. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. "EMERGENCY POWER."
  - 2. "POWER."
  - 3. "UPS."
- L. 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.
- M. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

- N. 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.
- O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
  - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- S. Metal Tags:
  - 1. Secure using plenum-rated cable ties.
- T. Nonmetallic Preprinted Tags:1. Secure using plenum-rated cable ties.
- U. Write-on Tags:
  - 1. Place in a location with high visibility and accessibility.
  - 2. Secure using general-purpose cable ties.
- V. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

### 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 of high visibility. Identify by system and circuit designation.

- C. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Vinyl wraparound labels.
  - 1. Locate identification 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.
- D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
  - 1. "EMERGENCY POWER."
  - 2. "POWER."
  - 3. "UPS."
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, use vinyl wraparound labels to identify the phase.
  - 1. Locate identification 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.
- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
  - 1. Apply to exterior of door, cover, or other access.
  - 2. 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. Arc Flash Warning Labeling: Self-adhesive labels. Secure on all:
  - a. Panelboards
  - b. Switchboards
  - c. Switchgear
  - d. Transformers
  - e. Substations
  - f. Motor-control centers

- K. Operating Instruction Signs: Self-adhesive labels.
- L. Equipment Identification Labels:
  - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Emergency system boxes and enclosures.
    - d. Enclosed switches.

END OF SECTION 260553

## SECTION 262416 - PANELBOARDS

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. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Lighting and appliance branch-circuit panelboards.

### 1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. MCCB: Molded-case circuit breaker.
- 1.4 SUBMITTALS
  - A. Product Data: For each type of panelboard.
    - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
    - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - B. Shop Drawings: For each panelboard and related equipment.
    - 1. Include dimensioned plans, elevations, sections, and details.
    - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
    - 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
    - 4. Detail bus configuration, current, and voltage ratings.
    - 5. Short-circuit current rating of panelboards and overcurrent protective devices.
    - 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.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

### 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. Keys: Two spares for each type of panelboard cabinet lock.
- 1.7 QUALITY ASSURANCE
  - A. Manufacturer Qualifications: ISO 9001 or 9002 certified.
- 1.8 DELIVERY, STORAGE, AND HANDLING
  - A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
  - B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

### 1.9 FIELD CONDITIONS

- A. Environmental Limitations:
  - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
    - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

- 1. Ambient temperatures within limits specified.
- 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Project Manager no fewer than two weeks (10 Days) in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Owner's written permission.
  - 3. Comply with NFPA 70E.

## 1.10 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: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PANELBOARD COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Height: 84 inches maximum, line up tops of dissimilar sized panelboards mounted adjacent to each other.
  - 3. 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.
  - 4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

- 5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
- 6. Finishes:
  - a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
  - b. Back Boxes: Galvanized steel.
  - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components..
- F. Incoming Mains:
  - 1. Location: Top or Bottom, refer to electrical drawings.
  - 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Terminations shall allow use of 75 deg C rated conductors without derating.
  - 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  - 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  - 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical shortcircuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
  - 1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  - 2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

# 2.2 BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management Electrical Distribution.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

## 2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management Electrical Distribution.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; by Schneider Electric.
- 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. 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. Application Listing: Appropriate for application
  - f. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units. Unless otherwise noted on the drawings.
  - g. Multipole units enclosed in a single housing with a single handle.
  - h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
  - i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

### 2.4 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: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- D. Equipment Mounting:
  - 1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
- I. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- J. 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.
- K. Install filler plates in unused spaces.
- L. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

## 3.3 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 after balancing panelboard 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.

## 3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Tests and Inspections:
  - 1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Panelboards will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies panelboards included. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
  - 1. Measure loads during period of normal facility operations.

- 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
- 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
- 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Standard-grade receptacles, 125 V, 20 A.
  - 2. Wall plates.

## 1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- C. RFI: Radio-frequency interference.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- 1.5 INFORMATIONAL SUBMITTALS
  - A. Field quality-control reports.
- 1.6 CLOSEOUT SUBMITTALS
  - A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

## PART 2 - PRODUCTS

### 2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with requirements in this Section.
- F. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
- G. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Essential Electrical System: Red.
- H. Wall Plate Color: For plastic covers, match device color.
- I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

## 2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.
  - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Duplex Receptacles, 125 V, 20 A:
  - 1. Description: Two pole, three wire, and self-grounding.
  - 2. Configuration: NEMA WD 6, Configuration 5-20R.

3. Standards: Comply with UL 498 and FS W-C-596.

## 2.3 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  - 3. Material for Unfinished Spaces: Galvanized steel.
  - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. 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 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 right 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 comply with NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
- b. Straighten conductors that remain and remove corrosion and foreign matter.
- c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace devices that have been in temporary use during construction and that 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, two-thirds to three-fourths of the way around terminal screw.
  - 6. Use a torque screwdriver when a torque is recommended or required by 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. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- 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.
  - 1. .
- 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.

#### 3.2 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use preprinted tape label (PTouch) machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- C. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

#### 3.3 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
  - 1. Test Instruments: Use instruments that comply with UL 1436.
  - 2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for 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 unacceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. Using the test plug, verify that the device and its outlet box are securely mounted.
  - 5. 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.
- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 262726

#### SECTION 262813 - FUSES

#### 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. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Cartridge fuses rated 600 V ac and less for use in the following:
    - a. Enclosed switches.
  - 2. Spare-fuse cabinets.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
  - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 3. Current-limitation curves for fuses with current-limiting characteristics.
  - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in PDF format.
  - 5. Coordination charts and tables and related data.
  - 6. Fuse sizes for elevator feeders and elevator disconnect switches.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," include the following:
  - 1. Ambient temperature adjustment information.
  - 2. Current-limitation curves for fuses with current-limiting characteristics.
  - 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in PDF format.
  - 4. Coordination charts and tables and related data.

#### 1.5 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

#### 1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bussmann, an Eaton business.
  - 2. Edison; a brand of Bussmann by Eaton.
  - 3. Littelfuse, Inc.
  - 4. Mersen USA.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

#### 2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

- 1. Type RK-5: 250 or 600-V, zero- to 600-A rating, 200 kAIC, time delay.
- 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. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 FUSE APPLICATIONS

A. Cartridge Fuses:1. Motor Branch Circuits: Class RK5, time delay.

#### 3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

#### 3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

#### SECTION 262816 - ENCLOSED SWITCHES

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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Enclosures

#### 1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

#### 1.4 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. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 5. 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.

- 1. Include plans, elevations, sections, details, and attachments to other work.
- 2. Include wiring diagrams for power, signal, and control wiring.

#### 1.5 CLOSEOUT DOCUMENTS

- A. Operation and Maintenance Data: For enclosed switches andto include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Manufacturer's written instructions for testing and adjusting enclosed switches
    - b. 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.

#### 1.6 MAINTENANCE MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 2. Fuse Pullers: Two for each size and type.

#### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

#### 1.8 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(s) from date of Substantial Completion.

#### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches 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 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, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
  - 1. Single throw.
  - 2. Three pole.
  - 3. 240 or 600-V ac.
  - 4. 1200 A and smaller.
  - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated 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.
  - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 5. Service-Rated Switches: Labeled for use as service equipment. Provide as indicated on drawings.

#### 2.3 ENCLOSURES

- A. Enclosed Switches: 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 gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel.
- C. Conduit Entry: Knock-outs for Type 1 and threaded hubs for Type 3R and Stainless Steel Type 4X.
- D. Operating Mechanism: The circuit-breaker operating handle shall be directly operable through the dead front trim of the enclosure. 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.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

#### 3.2 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches: 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 3R Type 4X.

#### 3.3 INSTALLATION

- A. Coordinate layout and installation of switches 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 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.

#### 3.4 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.

#### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. 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 that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
    - h. Verify correct phase barrier installation.
    - i. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
- C. Enclosed switches will be considered defective if they do not pass tests and inspections.

#### 3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

#### 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Interior LED luminaries, lamps, and drivers.
  - 2. Luminaire supports.

#### 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaires.
  - 4. Include emergency lighting units, including batteries and chargers.
  - 5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.

- 6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.
  - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
  - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  - 1. Provide a list of all luminaire types used on Project; use ANSI and manufacturers' codes.

#### 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. Drivers: One for every 10 of each type installed. Furnish at least one of each type.
  - 2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

#### 1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP 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 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
  - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- E. CRI of 80.
- F. Rated lamp life of 35,000 (minimum) hours.
- G. Drivers shall be dimmable from 100 percent to 10 percent of maximum light output with 0-10V input signal.
- H. Driver shall be accessible when ceiling is finished without the use of an access panel.
- 1.8 DELIVERY, STORAGE, AND HANDLING
  - A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

#### 1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) minimum from date of Substantial Completion.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product or its listed engineer's approved equivalent product indicated on drawings.

#### 2.2 LUMINAIRE 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. Recessed luminaires shall comply with NEMA LE 4.
- C. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- D. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

#### 2.3 MATERIALS

A. Metal Parts:

- 1. Free of burrs and sharp corners and edges.
- 2. Sheet metal components shall be steel unless otherwise indicated.
- 3. Form and support to prevent warping and sagging.
- B. Diffusers:
  - 1. Prismatic
  - 2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- C. Housings: Refer to Lighting Fixture Schedule on Drawings.

#### 2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

#### 2.5 LUMINAIRE SUPPORT

- A. Comply with requirements in 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 luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

#### 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 the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install drivers for each luminaire.
- D. Supports:
  - 1. All fixtures to be supported securely from building structure and/or walls and the responsibility for mounting same shall be that of this Contractor.
    - a. Where surface mounted fixtures are mounted from "lay-in" type ceilings, the fixtures shall be supported independent of respective lay-in panel channel support system and fastened to the building structural system. Support from all 4-corners.
  - 2. Sized and rated for luminaire weight.
  - 3. Able to maintain luminaire position after cleaning.
  - 4. Provide support for luminaire without causing deflection of ceiling or wall.
  - 5. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaires:
  - 1. Attached to ceiling structural members from a minimum of 2-diagonally opposite corners.
  - 2. Trim ring flush with finished surface.
- F. Ceiling-Grid-Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
  - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.
- G. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

#### 3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

#### 3.4 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 Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

#### 3.5 STARTUP SERVICE

A. Comply with requirements for startup of lighting controls for specialty lighting and lighting controls.

#### 3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
  - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
  - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 3. Adjust the aim of luminaires in the presence of the Architect

END OF SECTION 265119

#### SECTION 265213 - EMERGENCY AND EXIT 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.
- B. Division 26 Common Work Results for Electrical and Common Electrical Materials and Methods section apply to work specified in this is section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Exit signs.
  - 2. Luminaire supports.

#### 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Lumen: Measured output of lamp and luminaire, or both.
- D. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
  - 1. Include data on features, accessories, and finishes.
  - 2. Include physical description of the unit and dimensions.
  - 3. Battery and charger for light units.
  - 4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
  - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.
    - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

#### 1.5 SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Product Certificates: For each type of luminaire.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

#### 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. Drivers: One for every 10 of each type and rating installed. Furnish at least one of each type.
  - 2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
  - 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
  - 4. Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
  - 5. Self-contained/unitized fixture: One complete replacement for every 10 luminaires provided.

#### 1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is 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 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

#### 1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 5 year(s) minimum from date of Substantial Completion.

#### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- 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. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.
- G. Bulb Shape: Complying with ANSI C79.1.

#### 2.2 MATERIALS

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
  - 1. Smooth operating, free of light leakage under operating conditions.
  - 2. Designed to permit relamping without use of tools.
  - 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
  - 1. Prismatic glass or Prismatic acrylic.

- 2. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Housings:
  - 1. Extruded aluminum housing and heat sink.
  - 2. Painted finish.

#### 2.3 METAL FINISHES

A. 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.

#### 2.4 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.

#### D. Supports:

- 1. Sized and rated for luminaire and emergency power unit weight.
- 2. Able to maintain luminaire position when testing emergency power unit.
- 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
- 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Ceiling Grid Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
  - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

#### 3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

#### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

#### 3.5 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
  - 1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
    - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 265213

# WEST VIRGINIA LOTTERY VIDEO TEST LAB RENOVATIONS - 11th FLOOR

405 CAPITOL STREET, UPPER ATRIUM, CHARLESTON WEST VIRGINIA 25301

SCHEESER BUCKLEY MAYFIELD

# 900 PENNSYLVANIA AVE CHARLESTON, WV 25302

# **CONSTRUCTION DOCUMENTS** JULY 23, 2021

	DRAWING INDEX
	ARCHITECTURAL
A1.0 A2.0	COVER - DRAWING INDEX DEMO FLOOR PLAN & REFLECTED CEILING PLAN NEW WORK FLOOR PLAN & REFLECTED CEILING PLAN
	MECHANICAL
H1-0 H2-0 H2-1 H3-0	SCHEDULES AND SYMBOL LEGEND DEMO & NEW WORK - ELEVENTH FLOOR PLAN - MECHANICA NEW WORK - ELEVENTH FLOOR PLAN - MECHANICAL HVAC DETAILS AND FLOW DIAGRAMS
	ELECTRICAL
E0-1 E1-1 E1-2 E1-3 E2-1	LEGENDS & SCHEDULES - ELECTRICAL DEMOLITION & LIGHTING - ELEVENTH FLOOR PLAN - ELECTR POWER & SYSTEMS - ELEVENTH FLOOR PLAN - ELECTRICAL NEW WORK - TWELFTH AND ELEVENTH FLOOR PLAN - ELECT DETAILS - ELECTRICAL









PHONE(304) 346-0565 ° FAX.(304) 346-1522 MECHANICAL ENGINEERS / ELECTRICAL ENGINEERS







# DEMO KEYED NOTES

- () REMOVE EXISTING FLOORING, PREP FOR NEW FLOORING INSTALLATION.
- (2) REMOVE WALLS. UPPER PORTION TO REMAIN IN SOME LOCATIONS. REFER TO NEW RCP ON SHEET A2.0 FOR BULKHEAD CONDITION.
- (3) UPPER PORTION OF WALL TO REMAIN. REFER TO NEW RCP ON SHEET A2.0 FOR BULKHEAD CONDITION.
- (4) REMOVE DOORS & FRAMES FOR REUSE. UNUSED DOORS TO BE HANDED OVER TO OWNER UPON PROJECT COMPLETION.
- 5 REMOVE CEILING GRID. PREP FOR NEW CEILING INSTALLATION.
- (6) REMOVE LIGHT FIXTURE. SALVAGE FOR REUSE IN NEW LOCATION.

(7) CREATE NEW OPENING IN WALL. UPPER PORTION OF WALL TO REMAIN. REFER TO NEW RCP ON SHEET A2.0 FOR BULKHEAD CONDITION.

# LEGEND - CEILING HEIGHTS

A	+/- 8'-0" -MATCH HEIGHT OF Existing ceiling Being Removed
B	9'-0"
<b>(C)</b>	9'-8"

# CEILING LEGEND

	INTERIOR HVAC UNIT					
$\ge$	SUPPLY GRILLE/DIFFUSER/REGISTER					
	EXHAUST OR RETURN AIR GRILLE/DIFFUSER/REGISTER SEE MECHANICAL FOR ABOVE ITEMS					
۲	SPRINKLER					
	SPEAKER					
	LIGHT FIXTURES - SEE ELECTRICAL PLANS					
	2' X 2' ACOUSTIC TILE W/ 15/16" GRID WIDTH. ULTIMA TEGULAR 1912					
	CEILING NOT IN SCOPE OF WORK					
	NEW GYP. BOARD					
GENERAL NOTES						
IF ALTERNATE #1 IS NOT ACCEPTED, CEILING TO REMAIN AS-IS IN AREA INDICATED.						

OWNER TO REMOVE & STORE VIDEO LOTTERY EQUIPMENT & ASSOCIATED P. LAM CONSOLES PRIOR TO COMMENCEMENT OF DEMOLITION





# LEGEND - CEILING HEIGHTS



INTERIOR FINISH LEGEND								
FLOOR FINISH	ES							
CARPET NO. 1 STYLE: HYPE 5T065 SIZE: 24"X24" COLOR: ROUSE 64740 INSTALL: MONOLITHIC								
TILE NO. 1 STYLE: IQ GRANIT SD STATC DISSIPATIVE TILE SIZE: 24"X24" COLOR: 715 TAPESTRY								
BASE FINISHE	S							
4" RUBBER BASE STYLE/TYPE: 4" ROLLED COVE RUBBER BASE COLOR: 150 WETLANDS								
WALL FINISHES								
PAINT NO. 1	<u>PAINT NO. 1</u> <u>PAINT - <i>SHERWIN WILLIAMS</i></u> COLOR: SW6394 SEQUIN FINISH: EGGSHELL							

ROOM FINISH SCHEDULE										
ROOM NO.	BASE FINISH	FLOOR FINISH	WALL FINISH	NOTES						
1135	EXIST. / 4" RUBBER BASE	CARPET NO. 1	PAINT NO. 1							
1136	EXIST. / 4" RUBBER BASE	EXIST. / CARPET NO. I	PAINT NO. 1	PATCH FLOORING @ NEW DOOR OPENING						
1139	EXIST. / 4" RUBBER BASE	EXIST / TILE NO. 1	PAINT NO. 1	REPLACE TILE IN AREA INDICATED ON PLAN						
1140	EXIST. / 4" RUBBER BASE	CARPET NO. 1	PAINT NO. 1							

SCALE : 1" = 1'-0"

WALL TYPE 'C'



FIRE SUPPRESSION NEW WORK GENERAL NOTES THE GENERAL NOTES LISTED HERE APPLY TO ALL FIRE PROTECTION DRAWINGS IN ADDITION TO ANY ADDITIONAL DRAWING

NOTES ON THE INDIVIDUAL DRAWINGS. 2. SEE CODED NOTES ON INDIVIDUAL DRAWING SHEETS FOR SPECIFIC INSTRUCTIONAL NOTES.

3. FIELD VERIFY EXISTING CONDITIONS PRIOR TO THE START OF CONSTRUCTION.

4. COORDINATE WITH GENERAL TRADES WORK, HVAC WORK, PLUMBING WORK, ELECTRICAL WORK AND OTHER WORK. 5. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIRE AND SMOKE WALLS AND RATED STRUCTURES. SEE DETAILS AND SPECIFICATIONS FOR PIPE PENETRATION SEAL REQUIREMENTS.

3. REFER TO ARCHITECTURAL DRAWINGS FOR ROOM DESIGNATIONS INCLUDING ALL STORAGE AREAS. ALL STORAGE AREAS ARE TO BE SPRINKLERED AS ORDINARY HAZARD PER N.F.P.A.

7. IT IS RECOGNIZED THAT DRAWINGS MAY BE PLOTTED AT DIFFERENT SCALES, SUCH THAT PLOTTED DRAWINGS MAY VARY FROM ACTUAL OR INTENDED DIMENSIONS. THEREFORE, DRAWINGS ARE DIAGRAMMATIC AND ARE NOT TO BE SCALED. SBM TAKES NO RESPONSIBILITY FOR ERRORS REGARDING DISCREPANCIES FROM THE ORIGINAL DRAWINGS DRAWN AT THE PROPER SCALE AND THOSE DRAWINGS THAT HAVE BEEN PLOTTED.

8. THE FIRE PROTECTION DESIGN DRAWINGS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO SHOW EXACT LOCATION OF QUIPMENT AND PIPING UNLESS DIMENSIONS ARE GIVEN OR OTHERWISE IMPLIED FOR CLEARANCES, ETC. PIPING AND FIRE PROTECTION EQUIPMENT ARE TO BE INSTALLED ALONG THE GENERAL PLANS SHOWN ON THE DRAWINGS. BUT KEEPING IN MIND ACTUAL BUILDING CONDITIONS WHICH MUST BE CONFORMED WITH IN THE ACTUAL WORK. THIS CONTRACTOR TO BE AWARE OF LIMITED SPACE ABOVE CEILING FOR NEW WORK AND SHOULD MODIFY HIS WORK TO ACCOMMODATE OTHER TRADES. COORDINATE WORK WITH OTHER TRADES PRIOR TO MAKING THE FINAL INSTALLATION DRAWING OR SYSTEM INSTALLATION. THE CONTRACTORS IN THEIR BIDS ARE REQUIRED TO INCLUDE ALL LABOR AND MATERIALS AND OTHER RELATED WORK NECESSARY TO PROVIDE MINOR OFFSETS IN FIRE PROTECTION WORK AS REQUIRED TO AVOID CONFLICT WITH OTHER WORK ON THIS PROJECT, OR AS REQUIRED IN ORDER TO OBTAIN MAXIMUM HEAD ROOM OR EQUIPMENT ACCESS IN SPACES.

9. ALL SPRINKLER HEADS ARE TO MATCH EXISTING TYPES AND FINISHES. COORDINATE FINAL FINISH WITH ARCHITECT. 10. ALL FIRE PROTECTION PIPING AND CONDUIT SHALL FOLLOW THE INSTALLATION REQUIREMENTS AS LISTED BELOW: A. INSTALL TIGHT AGAINST BOTTOM OF ROOF AND FLOOR STRUCTURE. B. INSTALL PARALLEL AND PERPENDICULAR TO BUILDING STRUCTURE.

. INSTALL CONCEALED ABOVE CEILINGS OR INSIDE WALLS, UNLESS OTHERWISE NOTED. 1. USE INTERMEDIATE LEVEL SPRINKLERS BELOW DUCTWORK AND STRUCTURAL MEMBERS, WHERE APPLICABLE.

12. ALL VALVES, FLOW SWITCHES, AND ETC. ABOVE THE CEILING SHALL BE LABELED WITH ENGRAVED LAMINATE TAG ATTACHED TO CEILING GRID WITH PRESSURE SENSITIVE TAPE. THE (RED) LAMINATE TAG SHALL BE 1/2" WIDE WITH 1/4" HIGH ENGRAVED (WHITE) LETTERS.

13. FIRE PROTECTION CONTRACTOR TO COORDINATE FINAL PLACEMENT OF SPRINKLER HEADS WITH REFLECTED CEILING PLANS. SPRINKLER HEADS SHALL BE INSTALLED IN STRAIGHT AND PARALLEL LINES CENTERED IN A SYMMETRICAL AND UNIFORM PATTERN IN THE CEILING TILES (TYP ALL HEADS).

14. SPRINKLER HEADS TO BE PROVIDED IN TYPES AND FINISHES AS SPECIFIED IN SPECIFICATIONS.

15. ALL WORK IS TO COMPLY WITH DESIGN AND INSTALLATION REQUIREMENTS PER NATIONAL FIRE PROTECTION AGENCY 13, THE WEST VIRGINIA FIRE CODE, AND THE OWNER'S INSURANCE COMPANY. THE MOST STRINGENT REQUIREMENTS SHALL 16. FIRE PROTECTION CONTRACTOR SHALL PERFORM WATER FLOW TEST PRIOR TO PERFORMING HYDRAULIC CALCULATIONS

AND SPRINKLER LAYOUT. TEST TO MEET N.F.P.A. REQUIREMENTS. CONTRACTOR SHALL COORDINATE WHEN TEST IS TO BE PERFORMED WITH OWNER AND COPY TEST RESULTS TO PROJECT ENGINEER AND OWNER. 17. FIRE PROTECTION CONTRACTOR SHALL HYDRAULICALLY CALCULATE AUTOMATIC SPRINKLER SYSTEM AND INSTALL NEW SYSTEM AS REQUIRED BY NEW CALCULATIONS AND DESIGN. THE FIRE PROTECTION CONTRACTOR SHALL DESIGN THE SYSTEM, SUBMIT AND ETC. AS LISTED BELOW:

A. COMPLETE AND RETURN A/E A COPY OF THE AUTOMATIC SPRINKLER SYSTEM SUPPLEMENT FORM FB-13; THE SUBMITTED PLANS AND CALCULATIONS MUST ALSO INDICATE THE CERTIFIED INDIVIDUAL INSTALLING THE SPRINKLER SYSTEM. B. PLANS FOR THE SPRINKLER SYSTEM SHALL CONTAIN THE FOLLOWING INFORMATION RELATIVE TO THE WATER SUPPLY: 1. THE PLANS SHALL SHOW THE WATER SUPPLY REQUIREMENTS FOR THE HYDRAULICALLY MOST DEMANDING AREA. THE DESIGN CALCULATIONS SHALL SUBSTANTIATE THAT THE AVAILABLE WATER SUPPLY WILL FULFILL THE SYSTEM REQUIREMENTS. 2. THE WATER SUPPLY REQUIREMENTS SHALL BE DETERMINED ACCORDING TO HAZARD CLASSIFICATION AS OUTLINED IN N.F.P.A. 13 AND WEST VIRGINIA FIRE CODE.

3. WHEN SPRINKLER SYSTEMS ARE CONNECTED TO CITY WATER MAINS, FLOW TEST RESULTS SHALL BE SUBMITTED. THE PLANS SHALL SHOW THE FOLLOWING INFORMATION ON WATER FLOW DATA WITH EXISTING OR PROPOSED WATER SUPPLY, DEAD END OR CIRCULATING: a. LOCATION AND ELEVATION OF STATIC AND RESIDUAL TEST GAGE WITH RELATION TO THE RISER REFERENCE POINT. . FLOW LOCATION.

STATIC PRESSURE, PSI I. RESIDUAL PRESSURE, PSI

e. FLOW, GPM f. DATE TIM

. TEST CONDUCTED BY OR INFORMATION SUPPLIED BY i. PLOTTED GRAPH SHOWING WATER SUPPLY CURVES AND SYSTEM REQUIREMENTS IN ACCORDANCE WITH SECTIONS 6-3, 6-2.4, AND A-7-2.1 OF N.F.P.A. 13, APPROVED ADDITION.

18. FIRE MAIN TO BE HYDRAULICALLY CALCULATED AND SIZED TO DESIGN INSTALLATION REQUIREMENTS AS PER N.F.P.A., SECTIONS 13, 14, AND 24.

	HVAC SYMBOL LEGEND								
ABBREVIATION	<u>SYMBOL</u>	DESCRIPTION							
RL	RL	REFRIGERANT LINES (2 OR 3)							
CD	CD	A/C CONDENSATE DRAIN							
	Ţ	TEMPERATURE SENSOR							
	$\bigcirc$	CODED NOTE (SEE SCHEDULE)							
	ME	MECHANICAL EQUIPMENT (SEE SCHEDULE)							
E.C.	E.C.	ELECTRICAL CONTRACTOR							
F.P.C.	F.P.C.	FIRE PROTECTION CONTRACTOR							
G.C.	G.C.	GENERAL CONTRACTOR							
H.C.	H.C.	HVAC CONTRACTOR							
P.C.	P.C.	PLUMBING CONTRACTOR							
T.C.C.	T.C.C.	TEMPERATURE CONTROL SUB-CONTRACTOR							
A.D.	A.D.	ACCESS DOOR							
A.F.F.	A.F.F.	ABOVE FINISHED FLOOR							
A.L.	A.L.	ACTIVE LENGTH							
MFR.	MFR.	MANUFACTURER							
N.O.	N.O.	NORMALLY OPEN							
N.C.	N.C.	NORMALLY CLOSED							
TYP.	TYP.	TYPICAL							
E.A.	E.A.	EXHAUST AIR							
R.A.	R.A.	RETURN AIR							
S.A.	S.A.	SUPPLY AIR							
		INDICATES TIE INTO EXISTING							
	— — — — — — — — — — — — — — — — — — —	INDICATES REMOVE TO POINT FOR RECONNECTION							
	— — — — E	INDICATES REMOVE TO POINT AND CAP							

#### FIRE SUPPRESSION DEMOLITION GENERAL NOTES THE GENERAL NOTES LISTED HERE APPLY TO ALL DEMOLITION DRAWINGS IN ADDITION TO ANY

ADDITIONAL DEMOLITION DRAWING NOTES ON THE INDIVIDUAL DEMOLITION DRAWINGS. . IT IS RECOGNIZED THAT DRAWINGS MAY BE PLOTTED AT DIFFERENT SCALES, SUCH THAT PLOTTED DRAWINGS MAY VARY FROM ACTUAL OR INTENDED DIMENSIONS. THEREFORE, DRAWINGS ARE DIAGRAMMATIC AND ARE NOT TO BE SCALED. SBM TAKES NO RESPONSIBILITY FOR ERRORS REGARDING DISCREPANCIES FROM THE ORIGINAL DRAWINGS DRAWN AT THE PROPER SCALE AND THOSE DRAWINGS THAT HAVE BEEN PLOTTED.

5. IF DURING CONSTRUCTION OPERATIONS, THE FIRE PROTECTION CONTRACTOR ENCOUNTERS UTILITIES OTHER THAN THOSE LOCATIONS SHOWN IN THE PLANS, HE SHALL IMMEDIATELY NOTIFY THE ENGINEER AND TAKE THE NECESSARY STEPS TO PROTECT THE FACILITY AND ASSURE THE CONTINUANCE OF

. WALLS SHOWN IN DASHED ARE BEING REMOVED.

5. DARK, DASHED LINES INDICATE PIPING AND EQUIPMENT TO BE REMOVED.

. UNLESS NOTED OTHERWISE, ALL PIPING TO BE DEMOLISHED SHALL BE REMOVED BACK TO THE MAIN AND CAPPED.

. CAP ALL REMAINING PIPING WITH SIMILAR MATERIALS. PIPE ENDS INDICATED TO BE CAPPED ARE NOT TO BE CRIMPED.

. PROVIDE HANGERS TO SUPPORT ANY REMAINING PIPING OR EQUIPMENT. . REMOVE ALL HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT BEING DEMOLISHED.

10. OWNER SHALL HAVE SALVAGE RIGHTS TO ANY EQUIPMENT OR MATERIALS BEING REMOVED. ANY EQUIPMENT OR MATERIALS REFUSED BY THE OWNER SHALL BE REMOVED FROM THE SITE. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

I. SEE SPECIFICATIONS FOR ALL CUTTING AND PATCHING REQUIREMENTS REQUIRED UNDER DEMOLITION AND ALSO INDICATED ON DRAWINGS.

2. THIS CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS INCLUDING LOCATIONS AND INVERTS AND REMOVE OR RELOCATE ALL FIRE SUPPRESSION PIPING THAT INTERFERES WITH NEW CONSTRUCTION PRIOR TO START OF WORK.

				V
NO.	MAKE	MODEL	TOTAL COOLING (MBH) AT 92°F OUTDOOR TEMP	HEATING
OD-1	DAIKIN	RELQ120TAYDA	119	
NOTES:				
1. SEE SPI	ECIFICATIONS F	FOR REQUIRED ACC	ESSORIES.	

PROVIDE CONDENSING UNITS WITH WIND BAFFLE TO ALLOW FOR LOW AMBIENT OPERATION. CONTRACTOR TO VERIFY PIPING SIZES AND LENGTHS.

	VRV INDOOR UNIT SCHEDULE     O													
	MAKE	E MODEL	TYPE	0514	SOUND	COOLING PERFORMANCE			HEATING PERFORMANCE		ELECTRICAL			
NO				CFM	(dBA)	INDOOR TEMP (DB/WB) F	OUTDOOR TEMP (°F)	TOTAL (MBH)	SENSIBLE (MBH)	EAT	мвн	МСА	VOLTAGE/ PHASE	- REMARKS
ID-1	DAIKIN	FXFQ24TVJU	3'x3' CEILING CASSETTE	777	28-36	75/62.6	92	21	17	68	28	0.7	208/1	PROVIDE WITH CONDENSATE PUMP
ID-2	DAIKIN	FXFQ24TVJU	3'x3' CEILING CASSETTE	777	28-36	75/62.6	92	21	17	68	28	0.7	208/1	PROVIDE WITH CONDENSATE PUMP
ID-3	DAIKIN	FXFQ24TVJU	3'x3' CEILING CASSETTE	777	28-36	75/62.6	92	21	17	68	28	0.7	208/1	PROVIDE WITH CONDENSATE PUMP
ID-4	DAIKIN	FXFQ24TVJU	3'x3' CEILING CASSETTE	777	28-36	75/62.6	92	21	17	68	28	0.7	208/1	PROVIDE WITH CONDENSATE PUMP
ID-5	DAIKIN	FXFQ24TVJU	3'x3' CEILING CASSETTE	777	28-36	75/62.6	92	21	17	68	28	0.7	208/1	PROVIDE WITH CONDENSATE PUMP
ID-6	DAIKIN	FXZQ15TAVJU	2'x2' CEILING CASSETTE	405	27-30	75/62.6	92	13	9.5	68	18	0.4	208/1	PROVIDE WITH OUTSIDE AIR CONNECTION AND CONDENSATE PUMP
ID-7	DAIKIN	FXZQ15TAVJU	2'x2' CEILING CASSETTE	405	27-30	75/62.6	92	13	9.5	68	18	0.4	208/1	PROVIDE WITH CONDENSATE PUMP
NOTES:		-		•	•	•	•	•	•	•	•			
1. SEI 2. TE	E SPECIFIC	ATIONS FOR RE	QUIRED ACCESSORIES. RE FOR RATING PURPOSES	ONLY. AND		REPRESENT ACTUA			S.					

## HVAC

. THE GENERAL N ADDITION TO ANY DEMOLITION DRAWIN 2. SEE CODED NOT NOTES. 3. FIELD VERIFY EX 4. COORDINATE WIT

5. IT IS RECOGNIZE THAT PLOTTED DRA THEREFORE, DRAWN NO RESPONSIBILITY DRAWINGS DRAWN PLOTTED.

ELECTRICAL WORK

6. PHASING - SEE SPECIFIC PHASING WITH THE OWNER. REQUIRED. UNLESS SYSTEMS SHALL NO SYSTEMS SHALL NO BUILDING FREEZE F 7. DARK, DASHED

8. SEE SPECIFICATION UNDER DEMOLITION. 9. SEE SPECIFICATION REMOVED. 10. REMOVE ALL HA

BEING DEMOLISHED. REMAINING PIPING, 11. CAP ALL REMAI WATERTIGHT. PIPE PIPING SHALL BE II 12. CAP ALL REMAI AND SEALED AIRTIG MATERIALS SPECIFIE

13. SEE SPECIFICAT CONTAINING MATERI 14. REMOVE ALL TH DEMOLISHED EQUIPN AIRTIGHT. CRIMPING

15. THE HVAC CON 12TH FLOOR CEILING AND EQUIPMENT. ASSOCIATED CEILING

FOR THIS WORK.

16. WHERE EXISTIN CONTRACTOR TO RE FIRESTOPPING MATE SLEEVE ASSEMBLY MATERIALS, MATCHI 17. THE GENERAL

OF 11TH FLOOR CE AND EQUIPMENT. ASSOCIATED CEILING FOR THIS WORK.

C DEMOLITION GENERAL NOTES	HVAC NEW WORK GENERAL NOTES						
OTES LISTED HERE APPLY TO ALL HVAC DEMOLITION DRAWINGS IN ADDITIONAL DEMOLITION DRAWING NOTES ON THE INDIVIDUAL	1. THE GENERAL NOTES LISTED HERE APPLY TO ALL HVAC DRAWINGS IN ADDITION TO ANY ADDITIONAL DRAWING NOTES ON THE INDIVIDUAL DRAWINGS.						
IGS. ES ON INDIVIDUAL DRAWING SHEETS FOR SPECIFIC INSTRUCTIONAL	2. REFER ALSO TO DUCTWORK MATERIAL SCHEDULE AND NOTES FOR ADDITIONAL GENERAL NOTES APPLICABLE TO DUCTWORK.						
ISTING CONDITIONS.	3. SEE CODED NOTES ON INDIVIDUAL DRAWING SHEETS FOR SPECIFIC INSTRUCTIONAL NOTES.						
H GENERAL TRADES WORK, PLUMBING WORK, FIRE PROTECTION WORK,	4. FIELD VERIFY EXISTING CONDITIONS.						
D THAT DRAWINGS MAY BE PLOTTED AT DIFFERENT SCALES, SUCH	5. COORDINATE WITH GENERAL TRADES WORK, PLUMBING WORK, FIRE PROTECTION WORK, ELECTRICAL WORK AND OTHER WORK.						
WINGS MAY VARY FROM ACTUAL OR INTENDED DIMENSIONS. NGS ARE DIAGRAMMATIC AND ARE NOT TO BE SCALED. SBM TAKES FOR ERRORS REGARDING DISCREPANCIES FROM THE ORIGINAL AT THE PROPER SCALE AND THOSE DRAWINGS THAT HAVE BEEN	6. IT IS RECOGNIZED THAT DRAWINGS MAY BE PLOTTED AT DIFFERENT SCALES, SUCH THAT PLOTTED DRAWINGS MAY VARY FROM ACTUAL OR INTENDED DIMENSIONS. THEREFORE, DRAWINGS ARE DIAGRAMMATIC AND ARE NOT TO BE SCALED. SBM TAKES NO RESPONSIBILITY FOR ERRORS REGARDING DISCREPANCIES FROM THE ORIGINAL DRAWINGS DRAWN AT THE PROPER SCALE AND THOSE DRAWINGS THAT HAVE BEEN						
DIVISION 1 PROJECT SPECIFICATION PHASING DOCUMENTS FOR INSTRUCTIONS. COORDINATE SHUT-DOWN OF ANY UTILITY IN ADVANCE ACCOMPLISH DRAIN DOWN AND RE-FILL OF PIPING SYSTEMS AS S OTHERWISE SPECIFICALLY INDICATED, EXISTING CHILLED WATER DT BE DISRUPTED DURING THE COOLING SEASON, AND HEATING DT BE DISRUPTED WHEN REQUIRED FOR OCCUPANT COMFORT OR PROTECTION.	PLOTTED. 7. THE MECHANICAL DESIGN DRAWINGS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO SHOW EXACT LOCATION OF EQUIPMENT, PIPING AND DUCTWORK UNLESS DIMENSIONS ARE GIVEN OR OTHERWISE IMPLIED FOR CLEARANCES, ETC. PIPING, DUCTWORK AND MECHANICAL EQUIPMENT ARE TO BE INSTALLED ALONG THE GENERAL PLANS SHOWN ON THE DRAWINGS, BUT KEEPING IN MIND ACTUAL BUILDING CONDITIONS WHICH MUST BE CONFORMED WITH IN THE ACTUAL WORK. CONTRACTORS IN THEIR BIDS ARE REQUIRED TO DOMINICAL HERDER AND AND ACTUAL BUILDING FOR THEIR BIDS ARE REQUIRED TO						
ONS FOR GENERAL CUTTING AND PATCHING REQUIREMENTS REQUIRED	MINOR OFFSETS IN MECHANICAL WORK AS REQUIRED TO AVOID CONFLICT WITH OTHER WORK ON THIS PROJECT, OR AS REQUIRED IN ORDER TO OBTAIN MAXIMUM HEAD ROOM						
ALSO SEE DRAWINGS FOR MORE SPECIFIC REQUIREMENTS.	OR EQUIPMENT ACCESS IN SPACES. 8. PHASING – SEE DIVISION 1 PROJECT SPECIFICATION PHASING DOCUMENTS FOR						
ANGERS AND SUPPORTS SERVING PIPING, DUCTWORK AND EQUIPMENT PROVIDE AND/OR ADJUST EXISTING HANGERS TO SUPPORT ANY DUCTWORK, OR EQUIPMENT ADJACENT TO DEMOLISHED.	SPECIFIC PHASING INSTRUCTIONS. COORDINATE SHUT-DOWN OF ANY UTILITY IN ADVANCE WITH THE OWNER. ACCOMPLISH DRAIN DOWN AND RE-FILL OF PIPING SYSTEMS AS REQUIRED. UNLESS OTHERWISE SPECIFICALLY INDICATED, EXISTING CHILLED WATER SYSTEMS SHALL NOT BE DISRUPTED DURING THE COOLING SEASON, AND HEATING SYSTEMS SHALL NOT BE DISRUPTED WHEN REQUIRED FOR OCCUPANT COMFORT OR BUILDING FREEZE PROTECTION						
NING ACTIVE PIPING WITH SIMILAR MATERIALS TO MATCH EXISTING ENDS INDICATED TO BE CAPPED ARE NOT TO BE CRIMPED. INSULATED NSULATED AT CAP WITH MATERIALS SPECIFIED FOR NEW WORK.	9. MAINTAIN REQUIRED RIGGING ACCESS CLEARANCES. COORDINATE CLEARANCE REQUIREMENTS WITH OTHER TRADES.						
INING ACTIVE DUCTWORK WITH SIMILAR MATERIALS TO MATCH EXISTING GHT. INSULATED DUCTWORK SHALL BE INSULATED AT CAP WITH ED FOR NEW WORK.	10. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIRE AND SMOKE WALLS AND RATED STRUCTURES. SEE DETAILS AND SPECIFICATIONS FOR PIPE PENETRATION SEAL REQUIREMENTS.						
TIONS FOR SPECIFIC REQUIREMENTS FOR DEMOLITION OF REFRIGERANT	11. H.C. IS TO COORDINATE ALL MASONRY PENETRATION LOCATIONS AND SIZES WITH G.C.						
HERMOSTATS, TEMPERATURE CONTROL WIRING AND PIPING FROM MENT BACK TO (MAIN SOURCE/WALL) AND CAP CONTROL AIR PIPING SHALL NOT BE CONSIDERED ADEQUATE.	12. COORDINATE EXACT POSITIONING OF FLOOR DRAINS WITH PLUMBING CONTRACTOR TO SERVE HVAC EQUIPMENT AS INTENDED, AND TO AVOID TRIPPING HAZARDS WITH ABOVE FLOOR DRAIN PIPING.						
NTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL/REINSTALLATION OF	13. DO NOT ROUTE DUCTWORK OR PIPING OVER ELECTRICAL EQUIPMENT.						
G ASSOCIATED WITH DEMOLITION OF 12TH FLOOR PIPING, DUCTWORK, THE HVAC CONTRACTOR SHALL TEMPORARILY SUPPORT ALL G FQUIPMENT SUCH AS LIGHTS, SMOKE DETECTORS, FTC, AS REQUIRED	INTRODUCED TO THE SPACE, UNLESS NOTED OTHERWISE.						
NG PIPING IS MAINTAINED AT WALLS SHOWN TO BE DEMOLISHED.	15. UNLESS OTHERWISE INDICATED, ALL PIPING TO RUN GENERALLY BELOW DUCTWORK FOR ACCESS TO VALVING. DO NOT OBSTRUCT EQUIPMENT OR ACCESS DOORS. AVOID DUCTWORK OVER LIGHTS WHEREVER POSSIBLE.						
EMOVE ABANDONED SLEEVES ASSEMBLIES AND ANY ASSOCIATED ERIALS ON PIPING. PIPING INSULATION WITHIN AND AROUND THE IS TO BE REMOVED AND REPLACED WITH SIMILAR INSULATION ING EXISTING.	16. EQUIPMENT CONNECTION ARRANGEMENTS, FLANGES, UNIONS, VALVING, ETC. ARE NOT TYPICALLY SHOWN ON PLAN VIEWS. REFER TO DETAILS AND FLOW DIAGRAMS FOR REQUIREMENTS. INSTALL ALL VALVES AND OTHER ITEMS REQUIRING OR FACILITATING MAINTENANCE IN ACCESSIBLE LOCATIONS, AND SO AS TO NOT OBSTRUCT MAINTENANCE						
CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL/REINSTALLATION ILING ASSOCIATED WITH DEMOLITION OF 11TH FLOOR PIPING, DUCTWORK, THE GENERAL CONTRACTOR SHALL TEMPORARILY SUPPORT ALL G EQUIPMENT SUCH AS LIGHTS, SMOKE DETECTORS, ETC. AS REQUIRED	17. SEE TEMPERATURE CONTROL DRAWINGS AND COORDINATE WITH TEMPERATURE CONTROL CONTRACTORS FOR INSTRUMENTATION DEVICES REQUIRED TO BE INSTALLED IN PIPING AND DUCTWORK, TOGETHER WITH NECESSARY CLEARANCES FOR SAME.						
	18. THE HVAC CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL/REINSTALLATION OF 12TH FLOOR CEILING ASSOCIATED WITH INSTALLATION OF NEW 12TH FLOOR PIPING, DUCTWORK, AND EQUIPMENT. THE HVAC CONTRACTOR SHALL TEMPORARILY SUPPORT ALL ASSOCIATED CEILING EQUIPMENT SUCH AS LIGHTS, SMOKE DETECTORS, ETC. AS REQUIRED FOR THIS WORK.						
	19. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL/REINSTALLATION OF 11TH FLOOR CEILING ASSOCIATED WITH INSTALLATION OF NEW 11TH FLOOR PIPING, DUCTWORK, AND EQUIPMENT. THE GENERAL CONTRACTOR SHALL TEMPORARILY SUPPORT ALL ASSOCIATED CEILING EQUIPMENT SUCH AS LIGHTS, SMOKE DETECTORS, ETC. AS REQUIRED FOR THIS WORK.						
RV OUTDOOR UNIT SCHEDULE							
G (MBH) AT O'F OUTDOOR MCA VOLTS/ DEMARKS							

MCA PHASÉ KEMARAS TEMP 43.3 460/3 126





### PLAN NOTES

- A. SEE SHEET H1-0 FOR HVAC GENERAL NOTES, SCHEDULES AND SYMBOL LEGEND.
- B. SEE SHEET SERIES H2-X FOR DEMOLITION AND NEW WORK PLANS.
- C. SEE SHEET SERIES H3-X FOR DETAILS AND FLOW DIAGRAMS.
- D. FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.

E. ALL DUCTWORK AND PIPING SHOWN THIS SHEET IS LOCATED IN CEILING SPACE UNLESS NOTED OTHERWISE. . REFER TO VRV SYSTEM FLOW DIAGRAM FOR APPROXIMATE REFRIGERANT PIPING

SIZES. VERIFY FINAL SIZES WITH MANUFACTURER. G. COORDINATE FINAL LOCATIONS OF VRV INDOOR UNITS WITH ARCHITECT AND EXISTING ABOVE CEILING CONDITIONS.

CODED NOTES

 $\frown$ 

- TEST AIRFLOW OF EXISTING DIFFUSER AND REPORT TO ENGINEER.
- 2. BALANCE EXISTING DIFFUSER TO AIRFLOW SHOWN.
- 3. UNDER ALTERNATE #1, RELOCATE DIFFUSER OUTSIDE OF RAISED CEILING AND REWORK ASSOCIATED DUCTWORK AS REQUIRED.
- 4. EXISTING VRV INDOOR UNIT TO REMAIN. TYPICAL.
- 5. (3) REFRIGERANT LINES (RL, RS AND RHG) UP.

6. TIE INTO EXISTING MAKE UP AIR DUCTWORK MAIN AND EXTEND 6"Ø DUCT TO DIFFUSER AS SHOWN. MODIFY EXISTING MAIN AS REQUIRED TO ALLOW FOR TIE IN. BALANCE TO 60 CFM. BALANCING DAMPER TO BE "IRIS" STYLE DAMPER OR APPROVED EQUAL. DIFFUSER TO BE 2'x2' "PRICE" MODEL SCD CONE DIFFUSER OR APPROVED EQUAL WITH 6"Ø NECK. SEE SPECIFICATIONS FOR INSULATION AND MATERIAL REQUIREMENTS.

7. TIE INTO EXISTING CD PIPING AND EXTEND 3/4" CD TO VRV INDOOR UNIT AS SHOWN. MODIFY EXISTING CD PIPING AS REQUIRED TO ALLOW FOR TIE IN. TYPICAL FOR ALL VRV INDOOR UNITS. MATCH EXISTING CD PIPING MATERIALS AND INSULATION.

8. EXISTING SPRINKLER SYSTEM TO BE REWORKED PER N.F.P.A. 13 REQUIREMENTS TO ACCOMMODATE ARCHITECTURAL CHANGES IN AREA DESIGNATED BY LARGE, DASHED LINES.

9. BRANCH SELECTOR BOX. ROUTE (3) REFRIGERANT LINES (RL, RS, RHG) FROM OUTDOOR UNIT TO SELECTOR BOX. INSTALL BOX TO ALLOW FOR MAINTENANCE ACCESS PER MANUFACTURER'S RECOMMENDATIONS.

10. NEW VRV INDOOR UNIT.

- 11. EXISTING THERMOSTAT TO BE REMOVED AND RELOCATED.
- 12. NEW LOCATION OF RELOCATED THERMOSTAT.
- 13. EXISTING THERMOSTAT TO REMAIN. TYPICAL UNLESS NOTED OTHERWISE. 14. NEW WALL MOUNTED THERMOSTAT.







### PLAN NOTES

- A. SEE SHEET H1-0 FOR HVAC GENERAL NOTES, SCHEDULES AND SYMBOL LEGEND.
- . SEE SHEET SERIES H2-X FOR DEMOLITION AND NEW WORK PLANS.
- SEE SHEET SERIES H3-X FOR DETAILS AND FLOW DIAGRAMS.
- . FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK.

E. ALL DUCTWORK AND PIPING SHOWN THIS SHEET IS LOCATED IN CEILING SPACE UNLESS NOTED OTHERWISE. F. REFER TO VRV SYSTEM FLOW DIAGRAM FOR APPROXIMATE REFRIGERANT PIPING SIZES. VERIFY FINAL SIZES WITH MANUFACTURER.

CODED NOTES	$\bigcirc$
1. (3) REFRIGERANT LINES (RL, RS, RHG) UP AND DOWN. CORE DRILL HOLES AND CEILING AS REQUIRED AND FIRESTOP. SEE DETAIL SHEET H3.0. PIPING CONCEALED IN CORNER OF ROOM. SEE ARCHITECTURAL DRAWINGS FOR ADDIT INFORMATION. COORDINATE LOCATION OF PIPING WITH G.C.	IN FLOOR TO BE FIONAL
2. (3) REFRIGERANT LINES (RL, RS, RHG) UP THROUGH ROOF. EXTEND TO VR OUTDOOR UNIT. SEE PIPE CURB DETAIL FOR PIPING ROOF PENETRATION REQUI INSTALL "PHP" ROOF PIPE SUPPORTS OR APPROVED EQUAL TO SUPPORT PIPI ROOF. OFFSET PIPING IN CEILING SPACE AS REQUIRED.	V REMENTS. NG ON
3. VRV CONDENSING UNIT. MOUNT ON 18" EQUIPMENT RAILS AND VIBRATION ISOLATORS. SEE EQUIPMENT RAIL DETAIL. SEE PIPE CURB DETAIL FOR REQU FOR PIPING PENETRATING ROOF TO SERVE OUTDOOR UNIT. EXISTING CURB TO REMOVED IN ITS ENTIRETY TO ALLOW FOR INSTALLATION OF NEW OUTDOOR UN	IIREMENTS BE NIT.







HVAC DETAILS AND FLOW DIAGRAMS

DATE 07.23.2021

TITLE

REVISIONS

# LOCATION 900 PENNSYLVANIA AVE CHARLESTON, WV 25302

OWNER WEST VIRGINIA LOTTERY

# VIDEO TEST LAB RENOVATIONS

PROJECT

15335 STATE James & Killed SÍGNATURE CONSULTANTS MECHANICAL / ELECTRICAL ENGINEERS

Scheeser Buckley Mayfield, LLC

1540 Corporate Woods Parkway

Uniontown, OH 44685

Phone: (330) 896-4664



	ELECTRICAL SYMBOL LEGEND									
NOTES:	DTES:									
<ol> <li>COORDINATE</li> <li>SWITCHES S</li> <li>SUBSCRIPT</li> </ol>	ALL DEVICE COLORS WITH THE ARCHITECT HALL BE MOUNTED AT 46" AFF UNLESS OTHERWISE NOTED. "R" INDICATES RED DEVICE CONNECTED TO EMERGENCY POWER.	4. RECEPTACL 5. REFER TO	LES TO BE MOUNTED AT 18" AFF TO CENTERLINE UNLESS OTHERWISE NOTED. FIRE ALARM SPECIFICATIONS FOR DETAILS AND ADDITIONAL INFORMATION.							
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	<u>SYMBOL</u>	DESCRIPTION					
Φ	HEAVY DUTY 20 AMP, 125 VOLT, DUPLEX GROUNDING TYPE RECEPTACLE. HUBBELL #HBL5362 (SPECIFICATION GRADE).	\$	DOT INDICATES NEW 20 AMP SWITCH INSTALLED IN EXISTING RECESSED BOX. RECONNECT TO NEW OR EXISTING BRANCH CIRCUIT WIRING. PROVIDE NEW COVERPLATE AS SPECIFIED.	V	REMOTE TEST SWITCH, KEY-OPERATED. WALL OR CEILING MOUNTED AS INDICATED ON PLANS.					
$\oplus$	TWO HEAVY DUTY 20 AMP, 125 VOLT, DUPLEX GROUNDING TYPE RECEPTACLES. HUBBELL #HBL5362 (SPECIFICATION GRADE). MOUNT IN COMMON BOX WITH COMMON PLATE.		LED LIGHTING FIXTURES . REFER TO LIGHTING FIXTURE SCHEDULE FOR DETAILS.	ĒĢ	V     –     VISUAL-ONLY       FIRE ALARM SPEAKER. WALL OR CEILING MOUNTED AS INDICATED ON PLANS.					
Ø	SPECIAL PURPOSE OUTLET. REFER TO DRAWINGS FOR DESCRIPTION. VERIFY EXACT LOCATION WITH ARCHITECT PRIOR TO ROUGH-IN.	⊠⊻¤⊻	CEILING OR WALL MOUNTED EXIT SIGN. SHADED AREA INDICATES LOCATION OF FACE(S). ARROWS INDICATE CHEVRONS. REFER TO LIGHTING FIXTURE SCHEDULE FOR DETAILS.	<u></u>						
0	HEAVY DUTY 20 AMP, 125 VOLT, TAMPER AND WEATHER RESISTANT DUPLEX GROUND FAULT INTERRUPTER TYPE RECEPTACLE. HUBBELL #GFTWRST20 (SPECIFICATION GRADE) WITH WEATHERPROOF "IN-USE" COVERPLATE. MOUNT VERTICALLY AT 24" AFG TO CENTERLINE UNLESS OTHERWISE NOTED.		DIGITAL SINGLE-BUTTON WALL SWITCH.							
WP/GFI			DIGITAL TWO-BUTTON WALL SWITCH.							
$\square$	BOX AROUND DEVICE INDICATES SURFACE MOUNTED IN 4" SQUARE BOX WITH EXPOSED WORK COVER UNLESS OTHERWISE NOTED.	0C1 ⊗	DIGITAL PASSIVE-INFRARED CORNER-MOUNT OCCUPANCY SENSOR.							
•	DOT INDICATES NEW 20A, 125 VOLT, DUPLEX GROUNDING TYPE RECEPTACLE INSTALLED IN EXISTING RECESSED BOX. RECONNECT TO NEW OR EXISTING BRANCH CIRCUIT WIRING. PROVIDE NEW COVERPLATE AS SPECIFIED.		DIGITAL DUAL-TECHNOLOGY CEILING-MOUNT OCCUPANCY SENSOR.							
	STANDARD STEEL JUNCTION BOX WITH COVER. LOCATE AND CONNECT AS DIRECTED.	0 <sub>PP1</sub>	DIGITAL SINGLE-RELAY ROOM CONTROLLER.							
J	TC – ABOVE CEILING AND COIL CONDUCTORS INSIDE BOX FOR FINAL CONNECTION BY TEMPERATURE CONTROLS CONTRACTOR.	O <sub>PP2</sub>	DIGITAL DUAL-RELAY ROOM CONTROLLER.							
	SEC – SECURED DOOR POWER SUPPLY (120V).	\$ (;)	ALL ITEMS SHOWN DASHED ON DEMOLITION PLANS TO BE REMOVED (UNLESS OTHERWISE NOTED).							
⊠	POINT OF CONNECTION TO ELECTRIFIED EQUIPMENT. VERIFY EXACT LOCATION WITH RESPECTIVE EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN.									
	TCP – TEMPERATURE CONTROL PANEL (120V).									
	SURFACE METAL RACEWAY WITH ELECTRICAL AND/OR TELECOM DEVICES.									
-	FUSIBLE DISCONNECT SWITCH, HEAVY DUTY TYPE, (UNLESS NOTED OTHERWISE ON DRAWINGS) COMPLETE WITH FUSETRONS SIZED TO PROTECT MOTOR, EQUIPMENT OR CONDUCTORS (WHICHEVER IS APPLICABLE). SIZE, POLES, AND TYPE AS INDICATED. HORSEPOWER RATED, QUICK-MAKE, QUICK-BREAK.									
PAN. ""	208/120V,3ø,4W PANELBOARD. REFER TO PANELBOARD SCHEDULE AND/OR SPECIFICATIONS FOR DETAILS.									
DIST. PAN.	DISTRIBUTION PANEL.									

	MECHANICAL EQUIPMENT SCHEDULE												
SE	WIRE/CONDUIT (NOTE 1)	'CONDUIT OTE 1)PANELCIRCUITDISCONNECT DESIGNATIONDISCONNECT DESCRIPTION (NOTE 2)DISCONNECT 					STARTER DESCRIPTION (NOTE 3)	CONNECTION TYPE (NOTE 4)	REMARKS				
	20A	1MB	37	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	3	0.8 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.3 MCA, 15A MOP				
	20A	1MB	35	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.3 MCA, 15A MOP				
	50B	N2	_	DS-OD-1	60A/3P/600V/50AF/NEMA 3R	ADJACENT TO UNIT	INTEGRAL	1	43.3 MCA, 50A MOP				

	MECHANICAL EQUIPMENT SCHEDULE														
MECHANICAL EQUIPMENT DESIGNATION	DESCRIPTION	LOCATION	APPARENT POWER	HP	VOLTAGE	PHASE	WIRE/CONDUIT (NOTE 1)	PANEL	CIRCUIT	DISCONNECT DESIGNATION	DISCONNECT DESCRIPTION (NOTE 2)	DISCONNECT LOCATION	STARTER DESCRIPTION (NOTE 3)	CONNECTION TYPE (NOTE 4)	REMARKS
BS-1	VRF BRANCH SELECTOR BOX	11TH FLOOR	167	-	208	1	20A	1MB	37	_	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	3	0.8 MCA, 15A MOP
ID-1	VRF CEILING CASSETTE	11TH FLOOR	146		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP
ID-2	VRF CEILING CASSETTE	11TH FLOOR	146		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP
ID-3	VRF CEILING CASSETTE	11TH FLOOR	146		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP
ID-4	VRF CEILING CASSETTE	11TH FLOOR	146		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP
ID-5	VRF CEILING CASSETTE	11TH FLOOR	146		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.7 MCA, 15A MOP
ID-6	VRF CEILING CASSETTE	11TH FLOOR	62		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.3 MCA, 15A MOP
ID-7	VRF CEILING CASSETTE	11TH FLOOR	62		208	1	20A	1MB	35	-	2-POLE TOGGLE SWITCH	ADJACENT TO UNIT	INTEGRAL	2	0.3 MCA, 15A MOP
OD-1	VRF CONDENSING UNIT	ROOF	28786	-	480	3	50B	N2	_	DS-0D-1	60A/3P/600V/50AF/NEMA 3R	ADJACENT TO UNIT	INTEGRAL	1	43.3 MCA, 50A MOP



BY E.C. 30A/240V/2P/15AF/NEMA 1 ABOVE CEILING.

2P TOGGLE SWITCH AT EACH UNIT BY EC. TO NEXT UNIT SF-FX

N.T.S

CONNECTION TYPE 1 DIAGRAM

CONNECTION TYPE 2 DIAGRAM N.T.S

CONNECTION TYPE 3 DIA N.T.S

		CONDUCT (AV	FOR SIZE VG)		CONDUIT SIZE			
	WIRE SIZE AMPS			А	В	С		
EEDER NO.	NOMINAL FEEDER SIZE (AMPS)	PHASE/ NEUTRAL	GROUND	2C	3C	4C		
				W/G	W/G	W/G		
		CU	CU	CU	CU	CU		
15	15	12	12	3/4"	3/4"	3/4"		
20	20	12	12	3/4"	3/4"	3/4"		
25	25	10	10	3/4"	3/4"	3/4"		
30	30	10	10	3/4"	3/4"	3/4"		
35	35	8	10	3/4"	3/4"	3/4"		
40	40	8	10	3/4"	3/4"	3/4"		
45	45	8	10	3/4"	3/4"	3/4"		
50	50	8	10	3/4"	3/4"	3/4"		
60	60	6	10	3/4"	3/4"	1"		
70	70	4	8	1"	1"	1-1/2"		
80	80	4	8	1"	1"	1-1/2"		
90	90	3	8	1"	1-1/2"	1-1/2"		
100	100	2	8	1"	1-1/2"	1-1/2"		



	MECHANICAL EQUIPMENT SCHEDULE NOTES
	1. SEE STANDARD FEEDER SCHEDULE FOR MORE INFORMATION.
TOGGLE SWITCH E.C.	2. WHERE THE DISCONNECT IS LISTED AS "INTEGRAL", THE UNIT IS BEING SUPPLIED WITH AN "INTEGRAL" DISCONNECTING MEANS. WHERE A SIZE, TYPE, ETC. IS SHOWN, IT IS TO BE FURNISHED AND INSTALLED BY E.C.
	3. WHERE THE STARTER IS LISTED AS "INTEGRAL", THE UNIT IS BEING SUPPLIED WITH AN "INTEGRAL" STARTER. WHERE A STARTER DESIGNATION IS SHOWN, IT IS TO BE FURNISHED AND INSTALLED BY E.C. SEE THE MOTOR STARTER SCHEDULE FOR MORE INFORMATION.
IAGRAM	4. SEE CONNECTION TYPE DIAGRAMS FOR MORE INFORMATION.

	PANELBOARD SCHEDULE									
PANEL	PANEL: <u>1MC</u> LOCATION: <u>11TH FLOOR</u> MOUNTING: <u>SURFACE</u>									
SERVICE: <u>208/120 VOLTS,3</u> PHASE,4_ WIRE,60_ HZ										
MAINS	MAINS 100 AMPS. X LUGS CCT. BKR.									
FED F	FED FROM <u>1MB</u> FULL CAPACITY, NEUTRAL, SEPARATE GROUNDING BUS									
LOAD	DESCRIPTION	CCT. BKR.	CCT. NO.				CCT. NO.	CCT. BKR.	DESCRIPTION	LOAD
R-600	TEST CABINET	20/1	1			$\vdash \frown$	2	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	3			<u> </u>	4	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	5	<u> </u>	$\square$		6	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	7			$\vdash \frown$	8	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	9		┝╋	$\vdash \frown$	10	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	11		$\square$		12	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	13			$\vdash \frown$	14	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	15	<u> </u>	┝╋		16	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	17	<u> </u>	$\square$		18	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	19				20	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	21		┝╋		22	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	23		$\square$		24	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	25				26	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	27	<u> </u>	┝╋	<u>-</u> ∽-	28	20/1	TEST CABINET	R-600
R-600	TEST CABINET	20/1	29	<u> </u>	H-		30	20/1	TEST CABINET	R-600
R-720	RECEPT. – ADMIN DESKS	20/1	31			<u> </u>	32	20/1	TEST CABINET	R-600
R-720	RECEPT. – ADMIN DESKS	20/1	33	<u> </u>	┝╋	$\vdash \frown$	34	20/1	TEST CABINET	R-600
H-854	VRF CASSETTES	20/1	35	<u> </u>	H-		36	20/1	SPARE	x
H-167	VRF BRANCH SELECTOR BOX	20/1	37		╞┼╴	<b>└</b> ─-	38	20/1	SPARE	x
x	SPARE	20/1	39	<u> </u>	┝	$\vdash \frown$	40	20/1	SPARE	x
x	SPARE	20/1	41		┡		42	20/1	SPARE	x
REMARI	<u>KS:</u>								LOAD LEGEND:	J
1. ALL 208V S	1. ALL NEW CIRCUIT BREAKERS TO BE 22,000 AIC FOR       R - RECEPTACLES       K - KITCHEN         208V SYSTEMS UNLESS OTHERWISE NOTED.       L - LIGHTING       M - MISCELLANEOUS         P - PLUMBING       F - FUTURE         H - HVAC									

	LIGHTING FIXTURE SCHEDULE									
SYMBOL	CATALOG NO.	DESCRIPTION	MOUNTING	LAMP(S)						
EX1	LE-S-1-R	LITHONIA: SIGNATURE SERIES EXIT SIGN, MATTE BLACK HOUSING WITH BRUSHED ALUMINUM FACE, RED LETTERS, AND (1) MULTI-VOLT LED DRIVER.	CEILING SURFACE	INTEGRAL LED						
ENGINEER APP	NGINEER APPROVED EQUIVALENT FIXTURES BY THE FOLLOWING MANUFACTURERS ARE ACCEPTABLE:									
<u>SYMBOL</u>	MANUFACTURER_									
EX1	DUAL-LITES, EMERGI-LITE, SURE-LITES, EXITRONIX									
LIGHTING FIXTU	JRE NOTES:									
1. "NL" SUBS 2. "EM" SUBS	<ol> <li>"NL" SUBSCRIPT INDICATES THAT FIXTURE IS CONNECTED TO AN UNSWITCHED CIRCUIT FOR "NIGHT LIGHT" ILLUMINATION.</li> <li>"EM" SUBSCRIPT INDICATES THAT FIXTURE IS CONNECTED TO AN EMERGENCY POWER (LIFE SAFETY) CIRCUIT FOR EGRESS ILLUMINATION.</li> </ol>									
		ALTERNATE LIGHTING FIXTURE SCHEDULE								
SYMBOL	CATALOG NO.	DESCRIPTION	MOUNTING	LAMP(S)						
R1	CPX-2X4-4000LM-80CRI-35K-SWL-MIN10-ZT-MVOLT	LITHONIA: CPX FLAT-PANEL FIXTURE, 2' X 4', WHITE ALUMINUM FRAME, 4000 LUMENS, 3500K, 39 WATTS, AND (1) MULTI-VOLT LED DRIVER.	CEILING RECESSED	INTEGRAL LED						
R2	CPX-2X2-3200LM-80CRI-35K-SWL-MIN10-ZT-MVOLT	LITHONIA: CPX FLAT-PANEL FIXTURE, 2' X 2', WHITE ALUMINUM FRAME, 3200 LUMENS, 3500K, 32 WATTS, AND (1) MULTI-VOLT LED DRIVER.	CEILING RECESSED	INTEGRAL LED						
R3	EPANL-2X4-4000LM-80CRI-35K-MVOLT-SLD	LITHONIA: EPANL SERIES FLAT-PANEL FIXTURE, 2' x 4', ALUMINUM FRAME, WHITE ARCYLIC LENS, 4000 LUMENS, 3500K, 37 WATTS, AND (1) MULTI-VOLT STEP-DIMMING LED DRIVER.	CEILING RECESSED	INTEGRAL LED						

SYMBOL	CATALOG NO.
R1	CPX-2X4-4000LM-80CRI-35K-SWL-MIN10-ZT-M
R2	CPX-2X2-3200LM-80CRI-35K-SWL-MIN10-ZT-M
R3	EPANL-2X4-4000LM-80CRI-35K-MVOLT-SLD
ENGINEER APP	ROVED EQUIVALENT FIXTURES BY THE FOLLOWING MANU
<u>SYMBOL</u>	MANUFACTURER
R1,R2,R3	EATON, COLUMBIA, PHILIPS, H.E. WILLIAMS
LIGHTING FIXTU	JRE NOTES:
1. FIXTURES	SHALL ONLY BE PROVIDED UNDER ALTERNATE.
2 "NI " SUBS	SCRIPT INDICATES THAT FIXTURE IS CONNECTED TO AN

"NL" SUBSCRIPT INDICATES THAT FIXTURE IS CONNECTED TO AN UNSWITCHED CIRCUIT FOR "NIGHT LIGHT" ILLUMINATION. "EM" SUBSCRIPT INDICATES THAT FIXTURE IS CONNECTED TO AN EMERGENCY POWER (LIFE SAFETY) CIRCUIT FOR EGRESS ILLUMINATION.



	ELECTRICAL GENERAL NOTES
1. DR <i>i</i>	THE GENERAL NOTES LISTED HERE APPLY TO ALL ELECTRICAL DRAWINGS IN ADDITION TO ANY ADDITIONAL DRAWING NOTES ON THE INDIVIDUAL
2. NT	ALL EXISTING ELECTRICAL DEVICES WITHIN HATCHED AREAS TO REMAIN IN OPERATION UNLESS SHOWN OTHERWISE. REFEED ANY ITEM WHOSE WIRING IS ERRUPTED DUE TO WORK IN ADJACENT AREAS.
<b>5</b> .	DARK, DASHED ITEMS INDICATE ELECTRICAL EQUIPMENT, DEVICES, AND/OR LIGHTING TO BE REMOVED UNDER THE DEMOLITION PHASE OF PROJECT.
R≀	SEE SPECIFICATIONS FOR GENERAL CUTTING AND PATCHING REQUIREMENTS REQUIRED DURING DEMOLITION AND NEW CONSTRUCTION PHASES. REFER TO WINGS FOR MORE SPECIFIC REQUIREMENTS.
<b>.</b>	SEE SPECIFICATIONS FOR SALVAGE RIGHTS TO ANY EQUIPMENT OR MATERIALS BEING REMOVED.
N`	REMOVE ALL HANGERS AND SUPPORTS SERVING CONDUIT AND WIRE TO BE DEMOLISHED. PROVIDE AND/OR ADJUST EXISTING HANGERS TO SUPPORT ( REMAINING CONDUIT AND WIRE, OR EQUIPMENT ADJACENT, TO REMAIN.
7.	REMOVE ALL EXISTING WIRE FROM CONDUITS TO BE ABANDONED. REFER TO SPECIFICATIONS FOR REQUIREMENTS REGARDING ABANDONED CONDUITS.
3.	DARKENED WALLS INDICATE NEW WALL CONSTRUCTION.
9. 100	EC SHALL REMOVE AND REINSTALL ALL CEILING MATERIAL AS REQUIRED FOR ELECTRICAL WORK SHOWN. REPLACE ALL MATERIAL DAMAGED BY THIS ITRACTOR.
0.	SEE CODED NOTES ON INDIVIDUAL DRAWING SHEETS FOR SPECIFIC INSTRUCTIONAL NOTES.
11.	FIELD VERIFY EXISTING CONDITIONS.
2. COI	COORDINATE ELECTRICAL WORK WITH ALL CONTRACTORS ON SITE (GENERAL TRADES, PLUMBING, FIRE PROTECTION, HVAC, ETC) PRIOR TO IMENCEMENT OF DEMOLITION/CONSTRUCTION WORK.
3. JNL 3H( 201 N EQL	THE ELECTRICAL DESIGN DRAWINGS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO SHOW EXACT LOCATION OF EQUIPMENT, LIGHTING, AND DEVICES ESS DIMENSIONS ARE GIVEN FOR CLEARANCES, ETC. LIGHTING, DEVICES AND ELECTRICAL EQUIPMENT ARE TO BE INSTALLED ALONG THE GENERAL PLANS DWN ON THE DRAWINGS, BUT KEEPING IN MIND ACTUAL BUILDING CONDITIONS WHICH MUST BE CONFIRMED WITH-IN THE ACTUAL WORK AREA. NTRACTORS, IN THEIR BIDS, ARE REQUIRED TO INCLUDE ALL LABOR AND MATERIALS AND OTHER RELATED WORK NECESSARY TO PROVIDE MINOR OFFSETS ELECTRICAL INSTALLATION TO AVOID CONFLICT WITH OTHER WORK ON THIS PROJECT, OR AS REQUIRED IN ORDER TO OBTAIN MAXIMUM HEAD ROOM OR JIPMENT ACCESS IN SPACES.
4. JTI	PHASING — SEE DIVISION 1 PROJECT SPECIFICATION PHASING DOCUMENTS FOR SPECIFIC PHASING INSTRUCTIONS. COORDINATE SHUT—DOWN OF ANY LITY IN ADVANCE WITH THE OWNER.
15.	MAINTAIN REQUIRED RIGGING ACCESS CLEARANCES. COORDINATE CLEARANCE REQUIREMENTS WITH OTHER TRADES.
16.	E.C. IS TO COORDINATE ALL MASONRY PENETRATION LOCATIONS AND SIZES WITH G.C.
17. REN	AN ATTEMPT HAS BEEN MADE TO SHOW ALL ELECTRICAL ITEMS TO REMAIN OR BE REMOVED. EC SHALL FIELD VERIFY EXISTING CONDITIONS AND IOVE AND/OR RELOCATE ANY ITEM WHICH INTERFERES WITH NEW CONSTRUCTION.
18. HA'	POWER AND TELECOM RISER PULL BOXES MAY NOT BE SHOWN. PROVIDE PULL BOXES AT LOCATIONS REQUIRED. IN NO CASE SHALL A FEEDER CONDUIT /E BENDS OF MORE THEN 270' WITHOUT THE INSTALLATION OF A PULL BOX.
19. INF	PROVIDE FIRESEALING OF ALL OPENINGS THROUGH FIRE RATED WALLS AND ASSEMBLIES. SEE DETAIL SHEETS AND SPECIFICATIONS FOR ADDITIONAL ORMATION AND REQUIREMENTS.
20. AR[ TO	EC TO COORDINATE ELECTRICAL AND TELECOMMUNICATIONS DEVICE LOCATIONS WITH ARCHITECTURAL ELEVATIONS PRIOR TO ROUGH-IN. IF ELEVATIONS NOT PROVIDED ON DOCUMENTS, EC SHALL COORDINATE LOCATIONS AND MOUNTING HEIGHTS WITH ARCHITECT. DEVICE REQUIRED TO BE RELOCATED DUE LACK OF COORDINATION WILL BE DONE AT THE CONTRACTOR'S EXPENSE.
21	RACEWAY AND CONDUCTORS MAY BE CONCEALED ABOVE CEILING OR IN WALL AT ELECTRICAL CONTRACTOR'S ORTION #12 AWC MINIMUM SIZE

21. RACEWAY AND CONDUCTORS MAY BE CONCEALED ABOVE CEILING OR IN WALL AT ELECTRICAL CONTRACTOR'S OPTION. #12 AWG MINIMUM SIZE CONDUCTOR UNLESS OTHERWISE NOTED. ALL RACEWAYS TO CONTAIN SEPARATE EQUIPMENT GROUNDING CONDUCTOR. ALL BRANCH CIRCUITS SHALL HAVE SEPARATE NEUTRAL CONDUCTOR. NEUTRAL CONDUCTOR SHALL NOT BE SHARED BETWEEN CIRCUITS. REFER TO SPECIFICATIONS FOR RACEWAY TYPE.

NUFACTURERS ARE ACCEPTABLE:



LEGENDS & SCHEDULES - ELECTRICAL

DATE 07.23.2021

TITLE

REVISIONS

# LOCATION 900 PENNSYLVANIA AVE CHARLESTON, WV 25302

OWNER WEST VIRGINIA LOTTERY



CONSULTANTS MECHANICAL / ELECTRICAL ENGINEERS Scheeser Buckley Mayfield, LLC 1540 Corporate Woods Parkway Uniontown, OH 44685 Phone: (330) 896-4664



SILLING



## PLAN NOTES

OVER TO THE OWNER'S STOCK. B. ALL EXISTING LIGHTING CIRCUITS SHALL BE MAINTAINED FOR REUSE. REWORK EXISTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW ROOM LAYOUT AND CONTROL SCHEMES.

A. DEMOLISHED LIGHTING CONTROL DEVICES THAT ARE NOT REUSED SHALL BE TURNED

REPROGRAM LIGHTING CONTROLS AS REQUIRED.

0	CODED NOTES	$\bigcirc$
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1. EXISTING LIGHTING CONTROL DEVICE TO BE REMOVED AND RELOCATED. MAINTAIN EXISTING CAT5 CABLE FOR REUSE. REFER TO LIGHTING PLAN. . NEW LOCATION OF LIGHTING CONTROL DEVICE REMOVED DURING DEMOLITION. PROVIDE NEW CAT5 CABLE BETWEEN THE DEVICE AND THE EXISTING DIGITAL

LENGTH IS SUFFICIENT TO REACH THE POWERPACK. ALTERNATE: A NEW HIGHER CEILING WILL BE PROVIDED IN THIS AREA. LIGHTING SHALL BE REMOVED, REINSTALLED IN NEW CEILING, AND RECONNECTED TO EXISTING CIRCUIT. REFER TO ALTERNATE LAYOUT PLAN ON THIS SHEET.

4. EXISTING FIRE ALARM DEVICE TO BE REMOVED AND RELOCATED. REFER TO SYSTEMS PLAN.

5. DOUBLE DUPLEX RECEPTACLES ARE SURFACE-MOUNTED IN ENCLOSURES UNDERNEATH VIDEO EQUIPMENT. EACH DOUBLE DUPLEX RECEPTACLE IS CONNECTED TO A DEDICATED CIRCUIT IN PANEL 1MB. FIELD VERIFY EXACT WIRING. REMOVE RECEPTACLES AND ASSOCIATED CONDUIT AND WIRING BACK TO ACCESSIBLE CEILING. MAINTAIN EXISTING CIRCUITS FOR EXTENSION TO NEW LOCATIONS - REFER TO NEW WORK PLAN.

- 6. CABLE TRAY TO BE REMOVED AND STORED FOR REINSTALLATION.
- EXISTING TELECOM CABINET TO BE REMOVED BY OWNER.
- 8. CARDREADER TO BE RELOCATED. COORDINATE WITH SECURITY VENDOR. 9. EXISTING FIXTURE WITH STEP-DIMMING BALLAST. RE-WIRE FIXTURE AS REQUIRED TO BYPASS STEP-DIMMING FOR SIMPLE ON/OFF CONTROL.
- 10. DISCONNECT EXISTING FIXTURE. SPLICE AND EXTEND EXISTING UNSWITCHED EMERGENCY LIGHTING CIRCUIT IN ROOM TO FIXTURE AND CONNECT.
- 11. DISCONNECT AND REMOVE FIXTURE FOR RELOCATION.
- 12. NEW LOCATION OF EXISTING FIXTURE. SPLICE AND EXTEND LOCAL LIGHTING CIRCUIT TO FIXTURE AND CONNECT.
- 13. SPLICE AND EXTEND EXISTING UNSWITCHED EMERGENCY LIGHTING CIRCUIT TO NEW
- EXIT SIGN. 14. ALTERNATE: REPLACE ALL EXISTING 2X4 FIXTURES IN THIS ROOM WITH TYPE R1
- OR R2 AS REQUIRED..
- 15. ALTERNATE: REPLACE EXISTING FIXTURE WITH TYPE R2. 16. ALTERNATE: REPLACE ALL EXISTING 2X4 FIXTURES IN THIS ROOM WITH TYPE R3.
- 17. ALTERNATE: REPLACE EXISTING FIXTURE WITH TYPE EX1.
- 18. PROVIDE NEW OCCUPANCY SENSOR TO MATCH EXISTING.



ALTERNATE LIGHTING LAYOUT





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## CODED NOTES

1. NEW LOCATION OF FIRE ALARM DEVICE REMOVED DURING DEMOLITION. CONNECT TO EXISTING FIRE ALARM SYSTEM AS REQUIRED. 2. NEW FIRE ALARM DEVICE. MATCH EXISTING. CONNECT TO EXISTING FIRE ALARM SYSTEM AS REQUIRED.

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3. SPLICE AND EXTEND EXISTING CIRCUITS FROM PANEL 1MB TO SERVE NEW RECEPTACLES AS INDICATED.

4. QUAD RECEPTACLE IN ENCLOSURE UNDERNEATH VIDEO MACHINE (TYPICAL). RECEPTACLE BOX SHALL BE WIRED WITH A FLEXIBLE METAL CONDUIT WHIP AND SHALL NOT BE SECURED TO THE ENCLOSURE. COORDINATE EXACT LOCATIONS AND CONNECTIONS OF ALL RECEPTACLES UNDER VIDEO MACHINES WITH OWNER.

5. RELOCATED OR NEW CABLE TRAY AS REQUIRED. CONNECT TO EXISTING CABLE TRAY SYSTEM. MATCH EXISTING SIZE. PROVIDE CONTINUOUS BONDING CONDUCTOR IN CABLE TRAY BETWEEN EACH SECTION. BONDING CONDUCTORS SHALL BE #6 AWG MINIMUM.

6. NEW LOCATION OF CARDREADER REMOVED DURING DEMOLITION. SPLICE AND EXTEND ACCESS CONTROL CONDUIT AND WIRING AS REQUIRED. ALL NEW TELECOM CABLING SHALL TERMINATE IN EXISTING RACK IN THIS ROOM.

8. EXTEND EXISTING ELECTROSTATIC FLOOR GROUNDING INTO THIS AREA. PROVIDE ADDITIONAL 2" WIDE X 26 GAUGE COPPER GROUND STRIP TO MATCH EXISTING CADWELD #6AWG BARE COPPER GROUND TO GROUND STRIP AND TERMINATE TO BUILDING STEEL ABOVE CEILING WITH 2-HOLE COMPRESSION LUG.







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$\square$	CODED NOTES	$\bigcirc$
1. P	PROVIDE UNISTRUT MOUNTING STAND FOR DISCONNECT SWITCH.	
2.	UP TO "OD-1" THROUGH PATE PIPE ROOF CURB.	
3. PRO TYPI ACC	EXISTING 225A, 480/277V, 3PH, 4W PANEL (SQUARE D HCN I—LINE, 35KAIC). WIDE NEW 50/3P CIRCUIT BREAKER FOR CONNECTION TO "OD—1". MATCH EXIS E AND AIC RATING. REMOVE EXISTING SPARE BREAKERS AS REQUIRED TO COMMODATE NEW BREAKER.	STING
4.	CONNECT RECEPTACLE TO NEAREST RECEPTACLE CIRCUIT BELOW.	









CABLES ARE COMPLETELY INSTALLED.

WHERE CONDUIT, CABLES AND OTHER COMPONENTS PASS THROUGH FIRE OR SMOKE RATED WALLS OR FLOORS, PROVIDE NON-ASBESTOS SEAL ASSEMBLIES CLASSIFIED BY U.L. TO PROVIDE FIRE BARRIERS EQUAL TO OR GREATER THAN THE TIME RATING OF THE CONSTRUCTION BEING PENETRATED, WITH APPROPRIATE MATERIALS AND SYSTEMS THAT COMPLY WITH APPLICABLE CODES AND THAT HAVE BEEN TESTED IN ACCORDANCE WITH U.L. 1479 OR ASTM E814. GROUT, MORTAR OR GYPSUM BASED PRODUCTS SHALL NOT BE INSTALLED IN LIEU OF FIRESTOPPING MATERIALS AND U.L. SYSTEMS. 3. FOR SLEEVED PENETRATIONS, FIRESTOP ANNULAR SPACE, IF ANY, BETWEEN SLEEVE AND ADJACENT CONSTRUCTION TO MEET U.L. SYSTEM REQUIREMENTS. SEE NOTE 2 ABOVE. 4. THIS CONTRACTOR SHALL FIRESTOP ALL MISCELLANEOUS OPENINGS IN FIRE-RATED CONSTRUCTION RESULTING FROM HIS WORK. 5. CONTRACTOR SHALL PROVIDE SUBMITTAL DRAWINGS TO ENGINEER, INCLUDING U.L. RATED SYSTEM NUMBER AND DETAIL FOR EACH TYPE OF PENETRATION AND CONFIGURATION. 6. SLEEVES USED FOR CABLE RISERS THROUGH FLOORS OR WALLS SHALL BE INSTALLED PER THE ABOVE FLOOR OR WALL SECTIONS. IN ADDITION, FIRESTOP MATERIAL SHALL BE PROVIDED INSIDE SLEEVE AFTER

FIRESTOPPING DETAIL FOR PENETRATIONS THROUGH FIRE-RATED CONSTRUCTIONS N.T.S.





TELECOM DETAIL NOTES:

WITH OWNER'S IT DEPARTMENT.

SUPPORT ALL NEW CABLES.

GROUNDING/BONDING DETAILS.

CONSTRUCTION DUST OR DEBRIS.

PROVIDE BLANK MODULES IN ALL UNUSED PORTS.

(T-##)

EXISTING BASE).

REFER TO ELECTRICAL SYMBOL LEGEND AND SYSTEMS FLOOR PLANS FOR ROUGH-IN REQUIREMENTS.

THE WALL PLATE. JACK MODULES AND ASSOCIATED CABLE SHOULD BE PROVIDED AS REQUIRED.

PLACE MECHANICALLY-PRODUCED LABELS BEHIND FACEPLATE LABEL WINDOWS. DO NOT ATTACH LABELS

PROVIDE SUFFICIENT QUANTITIES OF PATCH PANELS (MFR AND CATEGORY TO MATCH EXISTING BASE) TO

VELCRO TY-WRAPS OF APPROPRIATE SIZE MUST BE USED FOR ALL CABLE BUNDLES WITHIN TELECOM ROOMS.

. IT IS THIS CONTRACTOR'S RESPONSIBILITY TO PROTECT THE TERMINATION PANELS FROM CONSTRUCTION DUST

THROUGH CONSTRUCTION PROCESS. ALL EQUIPMENT MUST BE TURNED OVER TO OWNER CLEAN AND FREE OF

**TELECOM MATERIAL NOTES** 

SINGLE-GANG FACEPLATE WITH SUFFICIENT PORTS TO SUPPORT ALL REQUIRED MODULES (BY SIEMON).

. CAT5E JACK MODULE (BY SIEMON) CONNECTED TO PATCH PANEL WITH CAT5E CABLE (COLOR TO MATCH

CAT5E CAT5E

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2-DATA WALL OUTLET

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(T-02)-

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. BOND ALL METALLIC EQUIPMENT TO THE TELECOM GROUNDING BUSBAR ACCORDING TO THE TELECOM

. CABLES MUST NEATLY SWEEP INTO TERMINATION POINT AND MUST NOT BLOCK OTHER EQUIPMENT.

DIRECTLY TO FACEPLATES OR WINDOWS. CONFIRM JACK MODULE COLOR CODING AND CABLE LABELING SCHEMES

OUTLET DETAILS ARE TYPICAL. SUBSCRIPT INDICATES THE QUANTITY OF TELECOM CABLES TO BE TERMINATED IN



### (REFER TO SPECIFICATIONS) **IDENTIFICATION TAGGING DETAILS** N.T.S.

# **TELECOM CABLE SUPPORT DETAIL**

MINIMUM 3/8" THREADED ROD TO STRUCTURE. CONTRACTOR HAS OPTION O PROVIDE FLANGE CLIP, BEAM CLAMP, OR PURLIN CLIP IN LIEU OF THREADED ROD WHERE APPROPRIATE.

└── J−HOOK.

FINISHED CEILING.

← 6" MINIMUM →

J-HOOK FASTENED TO WALL ABOVE CEILING. ANGLED HANGER BRACKET SIZED ACCORDING TO QUANTITY AND SIZE OF J-HOOKS ATTACHED.

FINISHED FLOOR









LIGHTING CONTROL NOTES EXISTING LIGHTING CONTROLS SHALL BE REUSED, UNLESS OTHERWISE NOTED. LIGHTING CONTROL

