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

State of West Virginia
Master Agreement

Order Date: 02-12-2025

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:	CMA 0211 4011 GSD2500000004 1	**Procurement Folder:**	1524853
Document Name:	Annual Chiller and Towers Maintenance	**Reason for Modification:**	
Document Description:	Annual Chiller and Towers Maintenance		
Procurement Type:	Central Master Agreement		
Buyer Name:			
Telephone:			
Email:			
Shipping Method:	Best Way	**Effective Start Date:**	2025-02-12
Free on Board:	FOB Dest, Freight Prepaid	**Effective End Date:**	2026-02-11

VENDOR

Vendor Customer Code: 000000202408
CASTO TECHNICAL SERVICES INC
540 LEON SULLIVAN WAY

CHARLESTON WV 25301
US
Vendor Contact Phone: 999-999-9999 **Extension:**

Discount Details:

	Discount Allowed	Discount Percentage	Discount Days
#1	No	0.0000	0
#2	No		
#3	No		
#4	No		

DEPARTMENT CONTACT

Requestor Name: Jeffrey L Gillenwater
Requestor Phone: 304-352-5490
Requestor Email: jeffrey.l.gillenwater@wv.gov

2025
FILE LOCATION _____

INVOICE TO

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

SHIP TO

DEPARTMENT OF ADMINISTRATION
GENERAL SERVICES DIVISION BLDG 11 - CHILLER PLANT
218 CALIFORNIA AVE
CHARLESTON WV 25305
US

CR 2-13-25
Purchasing Division's File Copy

Total Order Amount:	Open End

R-2/12/2025

PURCHASING DIVISION AUTHORIZATION	ATTORNEY GENERAL APPROVAL AS TO FORM	ENCUMBRANCE CERTIFICATION
DATE: 2/13/25	DATE: 2/13/2025	DATE: 2-13-25
ELECTRONIC SIGNATURE ON FILE	ELECTRONIC SIGNATURE ON FILE	ELECTRONIC SIGNATURE ON FILE

Extended Description:
Open-End Contract (CMA)

The Vendor, Casto Technical Services, agrees to enter into this Open-End contract with the General Services Division for HVAC Maintenance, specifically for the annual maintenance and cleaning of the HVAC's and towers in Building 11, per the bid requirements, specifications, terms and conditions, Addendum No. 1 dated 10/15/2024, Addendum No. 2 dated 10/28/2024, and the vendors submitted and accepted bid dated 11/06/2024 incorporated herein by reference and made a part hereof.

In accordance with W. Va. Code 5-22-1(a)(5), total payments under this contract will not exceed $500,000. This includes all payments under the initial contract term, any renewal terms, all delivery orders, and any change orders.

Line	Commodity Code	Manufacturer	Model No	Unit	Unit Price
1	73161517			LS	19740.000000
	Service From	**Service To**		**Service Contract Amount**	
				0.00	

Commodity Line Description: Lump Sum Fee for Annual Preventive Maintenance

Extended Description:
Lump Sum Fee for Annual Preventive Maintenance - see specifications

Line	Commodity Code	Manufacturer	Model No	Unit	Unit Price
2	73161517			HOUR	120.000000
	Service From	**Service To**		**Service Contract Amount**	
				0.00	

Commodity Line Description: Hourly Labor Rate

Extended Description:
Corrective Maintenance Hourly Labor Rate - see specifications

Line	Commodity Code	Manufacturer	Model No	Unit	Unit Price
3	73161517				0.000000
	Service From	**Service To**		**Service Contract Amount**	
				12000.00	

Commodity Line Description: Total Parts Cost

Extended Description:
Corrective Maintenance Total Parts Cost -
30% mark-up on parts

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: The Initial Contract Term will be for a period of One-year from award _____. The Initial Contract Term becomes effective on the effective start date listed on the first page of this Contract, identified as the State of West Virginia contract cover page containing the signatures of the Purchasing Division, Attorney General, and Encumbrance clerk (or another page identified as _____), and the Initial Contract Term ends on the effective end date also shown on the first page of this Contract.

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 three (3) successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed the total number of months available in all renewal years combined. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

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

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

☐ **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within _____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:

☐ the contract will continue for _____ years;

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

☐ **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.

☐ **Construction/Project Oversight:** This Contract becomes effective on the effective start date listed on the first page of this Contract, identified as the State of West Virginia contract cover page containing the signatures of the Purchasing Division, Attorney General, and Encumbrance clerk (or another page identified as _____), and continues until the project for which the vendor is providing oversight is complete.

☐ **Other:** Contract Term specified in _____

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.

☐ **Construction:** This Contract is for construction activity more fully defined in the specifications.

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 in this section must be provided to the Purchasing Division by the Vendor as specified:

☐ **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.

☑ Vendor shall provide "blanket" Performance, and Labor/Material bonds, in the amount of their bid to cover the life of the contract.

☐

☐

☐

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

Vendor must maintain:

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

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

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

☐ **Commercial Crime and Third Party Fidelity Insurance** in an amount of: _____ per occurrence.

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

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

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

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

☑ Certificate of Insurance must indicated Additional Insured.

☑ Certificate Holder must indicate:
General Services Division
1900 Kanawha Blvd. E.
Charleston, WV 25305

☐

☐

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. VENUE: All legal actions for damages brought by Vendor against the State shall be brought in the West Virginia Claims Commission. Other causes of action must be brought in the West Virginia court authorized by statute to exercise jurisdiction over it.

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 www.state.wv.us/admin/purchase/privacy.

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 NON-CONFLICT: Neither Vendor nor its representatives are permitted to have any interest, nor shall they 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.

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

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

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

37. NO DEBT CERTIFICATION: 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. By submitting a bid, or entering into a contract with the State, Vendor is affirming that (1) for construction contracts, the Vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, neither the Vendor nor any related party owe a debt as defined above, and neither the Vendor nor any related party are in employer default as defined in the statute cited above unless the debt or employer default is permitted under the statute.

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

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

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

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

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

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

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

b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process.

c. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:

    1. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars ($2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or

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

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

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

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

43. INTERESTED PARTY SUPPLEMENTAL DISCLOSURE: W. Va. Code § 6D-1-2 requires that for contracts with an actual or estimated value of at least $1 million, the Vendor must submit to the Agency a disclosure of interested parties prior to beginning work under this Contract. Additionally, the Vendor must submit a supplemental disclosure of interested parties reflecting any new or differing interested parties to the contract, which were not included in the original pre-work interested party disclosure, within 30 days following the completion or termination of the contract. A copy of that form is included with this solicitation or can be obtained from the WV Ethics Commission. This requirement does not apply to publicly traded companies listed on a national or international stock exchange. A more detailed definition of interested parties can be obtained from the form referenced above.

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

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

46. ISRAEL BOYCOTT: Bidder understands and agrees that, pursuant to W. Va. Code § 5A-3-63, it is prohibited from engaging in a boycott of Israel during the term of this contract.

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. BONDS: The following bonds must be submitted:

☑ **BID BOND:** 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 OR VENDOR'S BID WILL BE DISQUALIFIED.**

☑ **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. (Attorney General requires use of the State approved bond forms found at: www.state.wv.us/admin/purchase/forms2.html)

☑ **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. (Attorney General requires use of the State approved bond forms found at: www.state.wv.us/admin/purchase/forms2.html)

☐ **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system if the work impacts an existing roof. The amount of the bond must be equal to the price associated with the percentage of the project impacting the roof. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award. (Attorney General requires use of the State approved bond forms found at: www.state.wv.us/admin/purchase/forms2.html)

At a minimum, all construction projects require a bid bond, performance bond, and labor/material payment bond. Failure on the part of the state of West Virginia to checkmark the required bonds above does not relieve the vendor from the legal requirement of providing these bonds.

In lieu of the Bid 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 the bid bond must be of the same amount required of the Bid Bond and delivered with the bid.

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

3.1. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

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

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

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

i. Bidder's name

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

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

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

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

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

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

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

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

Subcontractor List Submission (Construction Contracts Only)

Bidder's Name: Costa Technical Services

☑ 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 8/24/2023

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.

(Printed Name and Title) April Dunlap

(Address) 340 Leon Sullivan Way, Charleston, WV 25301

(Phone Number) / (Fax Number) 304-346-0549 / 304-346-8920

(email address) adunlap@castotech.com

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through *wv*OASIS, I certify that: I have reviewed this Solicitation/Contract 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/Contract 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 this bid or offer was made without prior understanding, agreement, or connection with any entity submitting a bid or offer for the same material, supplies, equipment or services; that this bid or offer is in all respects fair and without collusion or fraud; 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; 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; and that pursuant to W. Va. Code 5A-3-63, the entity entering into this contract is prohibited from engaging in a boycott against Israel.

Casto Technical Services
(Company)

April Dunlap
(Signature of Authorized Representative)

April Dunlap, Sales Support
(Printed Name and Title of Authorized Representative) (Date)

304-346-0549 | 304-346-8920
(Phone Number) (Fax Number)

adunlap@castotech.com
(Email Address)

SPECIFICATIONS

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of the WV Department of Administration, General Services Division ("Agency"), to establish an open-end contract for HVAC Maintenance, specifically for the annual maintenance and cleaning of the HVACs and towers in Building 11 as specified by OEM (Original Equipment Manufacturer's) service schedules and manufacturers recommendations. The Contractor shall also conduct testing to ensure the units are returned fully operational, including providing on-site technical support. In accordance with W. Va. Code § 5-22-1(a)(5), total payments under this contract will not exceed $500,000. This includes all payments under the initial contract term, any renewal terms, all delivery orders, and any change orders.

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.

   2.1 **"HVAC Maintenance"** means Preventive Maintenance and Corrective Maintenance services provided by Vendor under this Contract and shall not include the addition of new HVAC equipment to increase the size or coverage area of the existing HVAC system.

   2.2 **"Preventive Maintenance"** means activities that have been specifically identified in Exhibits A, D and E. Preventive maintenance is intended to include regularly scheduled activities that are known and anticipated in advance rather than one-time repairs.

   2.3 **"Corrective Maintenance"** includes all work not identified as Preventive Maintenance in Exhibits A, D and E. Corrective Maintenance is intended to cover work performed on an as-needed basis to identify and correct a malfunction or failure in a HVAC system and testing to ensure that equipment is in proper working order after the repair. **Corrective Maintenance under this contract does not include an individual project that exceeds $25,000 in total value (including both parts and labor).** Any project that exceeds $25,000 in total value must be completed through the Purchasing Division's formal competitive bidding process.

   2.4 **"Pricing Pages"** means the schedule of prices, estimated quantity, and totals attached hereto as Exhibit C.

3. **PERFORMANCE REQUIREMENTS:** Vendor shall provide Agency with HVAC Maintenance on an open-end and continuing basis as outlined in this Contract.

3.1 HVAC Maintenance (Preventive and Corrective)

3.1.1 Vendor shall provide HVAC Maintenance in accordance with manufacturer's recommendations and specifications, as well as industry best practices, at all facilities listed on Exhibit B attached hereto and incorporated herein by reference.

3.1.2 Vendor shall furnish and install parts as necessary to keep the HVAC systems at each facility listed on Exhibit B in proper working order.

3.1.3 Vendor shall furnish all equipment, tools, and parts necessary for the performance of the HVAC Maintenance. Equipment and tools will be provided at no cost to the Agency.

3.1.4 Vendor shall provide expendable materials used in the scope of performing under this Contract at no cost to the Agency. Such items may include, but are not limited to, grease, cleaning supplies, rags, etc.

3.1.5 Vendor shall be responsible for replacement of ceiling grid and tiles should they become soiled or damaged by Vendor at no cost to the Agency. Agency will make final determination whether to clean or replace tiles on a case-by-case basis.

3.1.6 Vendor may only remove equipment from service for a period of 24 hours or more with written permission from the Agency. Any request to remove equipment for 24 hours or more must include a description of the work required and an estimate of the time the equipment will be out of service.

3.1.7 Vendor shall maintain a continuous 24-hour emergency telephone service where they can be reached every day of the week, including Sundays and Holidays.

3.1.8 Vendor shall not perform any HVAC Maintenance under this contract without prior approval from Agency.

3.1.9 Vendor shall furnish a warranty of 12 months for all labor performed under this contract.

3.1.10 Vendor shall make arrangements for the collection and disposal of their waste and construction related debris. Debris shall be removed on a daily basis.

3.2 Preventive Maintenance:

3.2.1 Vendor shall perform Preventive Maintenance on an annual basis in accordance with a schedule mutually agreed upon by the Vendor and Agency.

3.2.2 Vendor will be compensated for Preventive Maintenance activities through a lump sum fee following completion of the annual inspections, cleaning, and report (see Exhibit A). Vendor must provide parts necessary to perform Preventive Maintenance at no additional cost to Agency. Any cost for such parts must be included in the annual Preventive Maintenance fee.

3.2.2.1 Vendor must perform a visual inspection of all pumps and motors, for both the Chillers and Towers.
3.2.2.2 Vendor must grease all pumps and motors, for both the Chillers and Towers.
3.2.2.3 Vendor must check for excessive vibration, for both the Chillers and Towers.
3.2.2.4 Vendor must take amp draw readings on motors, for both the Chillers and Towers, and log information for annual comparison.

3.2.3 Vendor shall submit a proposed schedule of all Preventive Maintenance within 5 days of Vendor being awarded this contract for approval by Agency, at Agency's discretion.

3.2.4 Vendor shall take a **Monthly** oil sample for analysis. In addition, vendor shall provide an appropriately labeled portion of the oil sample taken to the Owner prior to submitting to laboratory for analysis.

3.3 Corrective Maintenance:

3.3.1 Vendor shall perform Corrective Maintenance as needed to restore the HVAC Systems to working order. Corrective Maintenance may include, but not be limited to, when the units, while in cool mode or standby mode, indicate an alarm in the Trane Tracer system or when the operator system indicates risk to equipment that may cause a failure of any unit operation. Vendor shall diagnose the cause of failure indicator and provide corrective action or repair, either mechanical or programming, to restore unit to normal operational mode and clear alarm trigger from the monitoring system. Vendor shall provide email address of contact person to whom technical services requests shall be sent.

Vendor shall report in with Agency representative immediately upon arrival, at which point Corrective Maintenance hours may be billed (no travel time may be billed). Vendor shall bill for Corrective Maintenance on an hourly basis. Parts for Corrective Maintenance may be billed using the multiplier bid as described below.

3.3.2 Vendor shall respond to Corrective Maintenance calls from Agency by phone or in person within two hours and must arrive on site to begin performance as soon as possible, but no later than four hours after Vendor is notified of the request. Vendor may only deviate from the required four-hour response time with written permission from the Agency.

3.3.3 Corrective Maintenance must be performed between the hours of 7:00 AM and 5:00 PM, Monday through Friday, excluding Holidays, unless the Agency approves work at another time.

3.3.3.1 Agency may request Corrective Maintenance on an emergency basis by notifying the Vendor of the emergency. Vendor must respond to all emergency requests within 30 minutes of being notified of the emergency request and arrive on site to begin performance no later than two hours after being notified of the emergency. Emergency requests can be authorized by Agency representative from GSD Operations and Maintenance Section or GSD Business Section.

3.3.4 Parts:

3.3.4.1 Vendor is responsible for procuring all necessary parts needed to perform HVAC Maintenance under this Contract within the required time frames established herein. Vendor must, however, obtain advanced approval from Agency prior to purchasing any part. Freight charges for parts are not permitted. See section 10.2.2. for more detail on freight charges.

3.3.4.2 Vendor shall maintain a supply or inventory of routinely used replacement parts for the HVAC equipment utilized by the Agency. All replacement parts shall be equal to or better than original manufacturer's parts. All parts used for replacement for normal wear or failed parts shall be new and obtained from authorized parts suppliers of the appropriate equipment manufacturer.

3.3.4.3 Parts Warranty: The Contractor shall provide a copy of the manufacturer's warranty on parts with the invoice.

4. **FACILITIES ACCESS:** The facilities identified in this contract may require access cards and/or keys to gain entrance.

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

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

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

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

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

5. **QUALIFICATIONS:**

   5.1 Experience: Vendor, or Vendor's employees that will be performing under this contract, must have successfully maintained HVAC equipment of the type, character and magnitude currently being utilized by Agency and included on the list of HVAC equipment, attached hereto as Exhibit B, on two or more occasions in the last five years. Vendor should provide information confirming its experience prior to contract award.

   5.2 Training: Vendor, or Vendor's employees that will be performing under this contract, shall be trained and/or certified to provide HVAC Maintenance on the equipment located at the Agency's facilities as shown on Exhibit B. Vendor must provide Agency with documentation satisfactory to verify training and certification upon request.

   Technicians performing work under this contract must have training and/or certification to provide HVAC maintenance on centrifugal chillers and towers. This training and/or certification may be from the manufacturers of the chillers and towers listed on Exhibit B (i.e. Trane and Marley), but may also be from manufacturers of similar equipment (chiller training and/or certification must be for centrifugal chillers). This documentation, for each technician, must be provided to the Agency prior to any technician performing any work.

5.3 Certifications: Vendor shall ensure that all HVAC Maintenance performed under this Contract is performed by an appropriately licensed individual. Required licenses may include, but are not limited to the following:

5.3.1 Electricians – WV Electricians License
5.3.2 Plumbers – WV Plumbers License
5.3.3 HVAC – EPA 608 Certification and Apprentice Certification or Completion of HVAC Vocational Program.
5.3.4 WV Contractor's License

5.4 Building Codes: At a minimum, the HVAC Maintenance shall comply with the current editions of the following standards and codes in effect at the time of performance.

5.4.1 National Electric Code (NEC)
5.4.2 International Building Code (IBC)
5.4.3 International Mechanical Code (IMC)
5.4.4 Underwriters Laboratories: Products shall be UL-916-PAZX listed.
5.4.5 ANSI/ASHRAE Standard 135-2004 (BACnet)
5.4.6 ANSI/EIA/CEA-709.1 (Lon Talk)
5.4.7 NFPA (National Fire Protection Association)

6. REPORTS: Vendor shall provide all the reports as outlined below.

6.1 Preventive Maintenance Log: Vendor shall provide and update a Preventive Maintenance log in the form of a chart posted in the vicinity of HVAC equipment. The Preventive Maintenance log must include a listing of all Preventive Maintenance performed, the name of the individual performing the Preventive Maintenance, the date it was performed, and the time spent performing the Preventive Maintenance. Vendor shall also maintain a duplicate maintenance log that Vendor must submit to Agency as requested.

Vendor shall develop, with Owner approval and acceptable report to provide such information as the Owner requests. Exhibit D Trane Manual contains an "Annual Inspection Check List and Report," which may be an acceptable report for annual inspections of the chillers (pending Owner approval).

6.2 Wiring Diagram: Vendor shall maintain updated wiring diagrams for the HVAC equipment. Vendor must permanently mount wiring diagrams on full-size display panels near the equipment controllers. These wiring diagrams are to remain the property of the Agency and will be surrendered upon termination of this contract.

6.3 Corrective Maintenance Log: Vendor shall maintain a log of all Corrective Maintenance performed under this Contract. The log must include the name of the individual performing the Corrective Maintenance, a description of the work performed, a list of any parts that were repaired or replaced, the total time spent performing the Corrective Maintenance, and the date and time Corrective Maintenance was performed. Vendor shall submit a copy of this log to Agency upon Agency's request.

Vendor shall develop, with Owner approval and acceptable report to provide such information as the Owner requests.

6.4 Quarterly and Annual Reports: Vendor shall provide quarterly reports and annual summaries to the Agency, and to the Purchasing Division when requested, with a detailed listing of HVAC Maintenance performed under this Contract during that period. The quarterly and annual reports must include a listing of the hours worked per project, the cost of hours worked per project, the total of all hours worked and corresponding cost, a listing of parts utilized per project, the cost of parts utilized per project, the total parts used for the period, the cost of parts for the period, a grand total of all costs for the period, and any other information that the Agency or Purchasing Division may request.

Vendor shall develop, with Owner approval and acceptable report to provide such information as the Owner requests.

6.5 Oil Sample Report: Vendor shall provide a copy of each oil analysis report generated from oil sample analysis.

7. **TRAVEL:** Vendor shall be responsible for all mileage and travel costs, including travel time, associated with performance of this Contract. Such costs will not be paid by the Agency.

8. **CONTRACT AWARD:** This Contract will be awarded to the Vendor meeting the required specifications that provides the lowest Total Cost on the Pricing Pages.

8.1 Pricing Pages: Vendor should complete the Pricing Pages by inserting the requested information in the appropriate location and performing the calculations necessary to arrive at a total cost. The requested information includes: a Lump Sum Fee for Annual Preventive Maintenance, the Total Yearly Cost, an Hourly Labor Rate, the Total Labor Cost, and parts Multiplier, the Total Parts Cost, and the Total Cost. Vendor should complete the Pricing Pages in their entirety as failure to do so may result in Vendor's bid being disqualified.

The Pricing Pages contain an estimated number of labor hours and an estimated cost for parts. The estimates for labor and parts represent an amount that will be utilized for evaluation purposes only. No future use of the Contract or any individual item is guaranteed or implied.

If responding in *wv*OASIS with an electronic bid:

Commodity Line 1: Insert the Lump Sum Fee for Annual Preventive Maintenance as the Unit Price.

Commodity Line 2: Insert the Hourly Labor Rate as the Unit Price.

Commodity Line 3: Insert the Total Parts Cost (in the example below, with a hypothetical bid of 20% markup on parts, one would enter $12,000) as the Contract Amount.

Vendor should type or electronically enter the information into the Pricing Pages to prevent errors in the evaluation. Notwithstanding the foregoing, the Purchasing Division may correct errors at its discretion.
An example of a properly completed Pricing Page is shown below for reference purposes only:

Lump Sum Fee for Annual Preventive Maintenance

Annual Fee	**x**	**1**	**=**	**Total Yearly Cost**
$20,000.00	**x**	**1**	**=**	**$20,000**

Hourly Labor Rate	**X**	**Est. Hrs.**	**=**	**Total Labor Cost**
$ 50	**x**	**200**	**=**	**$ 10,000**

Est. Parts Cost	**x**	**Multiplier**	**=**	**Total Parts Cost**
$10,000.00	**x**	**1.20**	**=**	**$ 12,000**

	Total Cost	**$ 42,000**

9. ORDERING:

9.1 Preventive Maintenance Ordering: After award of this Contract Agency and Vendor shall agree upon a Preventive Maintenance schedule. The Agency shall then issue a release order against this Contract covering the agreed upon Preventive Maintenance to be performed.

9.2 Corrective Maintenance Ordering: The Agency shall define the scope of each Corrective Maintenance project to be performed under this Contract and submit it to Vendor for a cost quote prior to Vendor's commencement of any work. The cost quote must detail the intended scope of work required to complete the project and contain an itemized listing of time and parts that will be required. If the Vendor's quote is satisfactory to the Agency, then Agency will issue a release order allowing Vendor to commence work. This release order shall have a unique number, reference the master contract number, and detail the scope of work for the project in question. Issuance of the release order to the Contractor shall be considered authorization to begin work. If the Agency determines that the cost quote is not satisfactory, then Agency and Vendor shall work to obtain a satisfactory cost quote by modifying the project, requesting different parts, performing labor with state employees, or other methods that Agency and Vendor deem appropriate. **Agency shall not issue a release order that allows Corrective Maintenance performed under this Contract to exceed $25,000 per project in total cost.**

In preparing cost quotes prior for Corrective Maintenance work, vendor should propose a timeframe for completion, from issuance of the Agency's delivery order to final completion. Agency will note this timeframe on each delivery order, and vendor must comply with completing each Corrective Maintenance order within such timeframe, or must notify the Agency, in writing in advance of the completion date established in the delivery order, if the initial timeframe cannot be met. In this written notification, the vendor should provide the reason for the delay, and should specifically request the number of additional calendar days required to complete the work. If in agreement, the Agency will issue a revised delivery order to modify the completion date.

9.3 Vendor is not permitted to perform any work other than that specified on the release order issued under section 9.1 or 9.2 of this Contract.

9.4 Issuance of multiple release orders to circumvent the $25,000 per project limitation on Corrective Maintenance is strictly prohibited.

9.5 Change orders that cause Corrective Maintenance to exceed $25,000 per project will not be permitted.

10. BILLING / PAYMENT:

10.1 Preventive Maintenance: All labor and parts associated with the Preventative Maintenance activities must be included in the Lump Sum Fee for Annual Preventive Maintenance. Vendor may submit invoices to obtain payment for Preventive Maintenance only upon completion of the Annual Preventive Maintenance services (i.e., cleaning, inspections, reports) for the four (4) HVACs covered under this contract.

10.2 Corrective Maintenance:

10.2.1 Labor: Labor for Corrective Maintenance will be billed on a per hour basis using the number of hours worked and the **single** hourly rate bid by vendor (i.e., no overtime rates may be billed). Vendor must submit requests for payment of Corrective Maintenance on a separate invoice provided the work has been completed.

10.2.2 Parts: Parts for Corrective Maintenance will be billed on a cost plus basis with the multiplier designated by Vendor on the Pricing Page to serve as the markup. (Examples of how the multiplier should be used are shown below) For purposes of this Contract, Vendor's cost is the amount paid by Vendor to the manufacturer or supplier and does not include Vendor's overhead, stocking fees, delivery charges, or other fees that are not direct payment for parts. All charges not associated with direct payments to the manufacturer or supplier must be accounted for in the markup represented by the multiplier.

Multiplier Example	Meaning
0.5	Vendor sells parts to Agency at one-half of Vendor's cost
1.0	Vendor sells parts to Agency at Vendor's cost
1.25	Vendor sells parts to Agency at Vendor's cost plus a 25% markup.
1.5	Vendor sells parts to Agency at its cost plus a 50% markup.

Notwithstanding the foregoing, Vendor may invoice Agency for expedited or emergency delivery of parts provided that the expedited or emergency delivery was requested by the Agency in advance, the delivery charge is specifically listed on the billing invoice to the Agency, the Agency pays no more than the actual delivery charge, and the actual delivery charge documentation is included with the invoice. Agency reserves the right to request invoice verification to establish parts cost to Vendor.

10.3 Invoicing:

10.3.1 Invoice should be emailed to **GSDinvoices@wv.gov**, or mailed to the following address:

General Services Division
112 California Ave.
Building 4, Fifth Floor
Charleston, WV 25305

11. DEFAULT:

11.1 The following shall be considered a default under this Contract.

11.1.1 Failure to perform HVAC Maintenance in accordance with the requirements contained in herein.

11.1.2 Failure to comply with other specifications and requirements contained herein.

11.1.3 Failure to comply with any applicable law, rule, ordinance, or building code applicable to this Contract or HVAC Maintenance generally.

11.1.4 Failure to remedy deficient performance upon request.

11.2 The following remedies shall be available upon default.

11.2.1 Cancellation of the Contract.

11.2.2 Cancellation of one or more release orders issued under this Contract.

11.2.3 Any other remedies available in law or equity.

11.3 Agency reserves the right to inspect the HVAC Maintenance to ensure that Vendor's performance is in compliance with this Contract. If Agency determines that Vendor has failed to perform in accordance with this Contract, Agency may demand that the Vendor immediately remedy the failure or consider the failure to be a default. Vendor's failure to remedy the deficient performance, if given the opportunity to do so, shall be considered a default.

12. MISCELLANEOUS:

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

Contract Manager: Ben Lancaster

Telephone Number: 304-807-0327

Fax Number: 304-346-8920

Email Address: blancaster@cesbotech.com

EXHIBIT A – PREVENTIVE MAINTENANCE

Preventive Maintenance Activities Include:

1. Annual maintenance and cleaning of the HVACs and towers in Building 11 as specified by OEM (Original Equipment Manufacturer's) service schedules and manufacturers recommendations. The Contractor shall also conduct testing to ensure the units are returned fully operational. There are 5 Trane HVACs and 5 Marley Towers (units), however **Chiller 2** will not be included in this contract.

	HVAC Serial Number	Model Number
1.	L99A00273	CVHF770
2.	L99A00282	CVHF770
3.	L99A00287	CVHF128
4.	L99A00279	CVHF128
5.	L99A00288	CVHF128

2. The vendor shall complete the annual comprehensive cleaning and inspection of the four (4) Trane HVACs and five (5) Marley Towers as specified in:

   Exhibit D Trane –CVHE-SVU01E-EN – Periodic Maintenance; Oil Maintenance and Maintenance Sections of the HVACs, and
   Exhibit E User Manual 02-1237 for the Marley Cooling Towers.

   All maintenance recommendations and specifications in the manuals shall be followed and performed by the Vendor.

3. Inspect and clean the interior of the four (4) Trane HVACs and four (4) Marley Towers, included in this contract, as recommended, or required by OEM's for the units.

4. Check all safety devices on all units; repair or replace parts necessary to bring safety devices back to OEM operating range.

5. Inspect all electronic transmitting/receiving components on all units, repair or replace as necessary to bring units back into OEM operating range.

6. Inspect all water control valves on all units; repair or replace as required to bring HVACs and towers back into OEM operating range.

7. Inspect and flush all chambers on all units; repair or replace as required to bring unit back into OEM operating range.

8. Provide oil analysis reports on each HVAC and perform analysis of eddy current tube and submit report of findings to Agency project manager in writing.

9. Following the completion of the Preventive Maintenance for each unit, the Contractor shall furnish a written inspection report (i.e., one report per unit) indicating all deficiencies and necessary repairs, no longer than forty-five (45) calendar days after the effective date of the Contract. The report shall be emailed to the following: Jeffrey.L.Gillenwater@wv.gov and Joseph.W.Belcher@wv.gov.

10. Report shall come in a format able to be edited (preferably a Microsoft Word document) and shall clearly be itemized and identifiable by HVAC and tower. It shall include estimates of both the quantity of labor hours and the materials costs for all repairs that are needed.

EXHIBIT B – AGENCY FACILITIES AND UNITS

Facility Location: WV State Capitol Complex, Central HVAC Plant (Building 11)

218 California Avenue
Charleston, WV 25305

There are 5 Trane HVACs and 5 Marley Towers (units). Chiller 2 will not be included in this contract.

HVAC Serial Number	Model Number
1. L99A00273	CVHF770
2. L99A00282	CVHF770 (not included)
3. L99A00287	CVHF128
4. L99A00279	CVHF128
5. L99A00288	CVHF128

REQUEST FOR QUOTATION
Annual Chillers and Towers Maintenance
CRFQ GSD2500000007

EXHIBIT C - PRICING PAGES

Preventive Maintenance:

Lump Sum Fee for Annual Preventive Maintenance	X	1	=	Total Yearly Cost
$ 19,740	X	1	=	$ 19,740

Corrective Maintenance:

Hourly Labor Rate	X	Estimated Hours	=	Total Labor Cost
$ 120	X		=	$

Estimated Parts Cost	X	Multiplier	=	Total Parts Cost
	X	1.3	=	$

Total Cost * **$**

* Total Cost is calculated by adding the Total Yearly Cost, Total Labor Cost, and the Total Parts Cost.

Exhibit E: Towers

User Manual

Manual 02-1237

Marley
Cooling Technologies

Contents

△ Note

This manual contains vital information for the proper installation and operation of your cooling tower. Carefully read the manual before installation or operation of the tower and follow all instructions. Save this manual for future reference.

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

△ Warning

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

△ Caution

Indicates presence of a hazard which will or can cause personal injury or property damage if ignored.

△ Note

Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

Preparation

The Marley NC cooling tower purchased for this installation represents the current state of the art in crossflow, induced draft cooling tower design. Thermally and operationally, it is the most efficient cooling tower of its class.

These instructions—as well as those offered separately on motors, fans, Geareducer®, couplings, drive shafts, fan shafts, float valves, etc.—are intended to assure that the tower serves you properly for the maximum possible time. Since product warrantability may well depend upon your actions, please read these instructions thoroughly prior to operation.

If you have questions about the operation and/or maintenance of this tower, and you don't find the answers in this manual, please contact your Marley sales representative. *When writing for information, or when ordering parts, please mention tower serial number shown on the nameplate located on the access door.*

Safety First

The location and orientation of the cooling tower can affect the safety of those responsible for installing, operating or maintaining the tower. However, since Marley does not determine the location or orientation of the tower, we cannot be responsible for addressing those safety issues that are affected by the tower's location or orientation.

△ Warning

The following safety issues should be considered by those responsible for designing the tower installation.

- ***access to hot water basins***
- ***access to and from maintenance access doors***
- ***the possible need for ladders (either portable or permanent) to gain access to the hot water basins or maintenance access doors***
- ***the possible need for external access platforms***
- ***potential access problems due to obstructions surrounding the tower***
- ***lockout of mechanical equipment***
- ***the possible need for safety cages around ladders***
- ***the need to avoid exposing maintenance personnel to the potentially unsafe environment inside the tower.***

Preparation

Those are only some of the safety issues that may arise in the design process. Marley strongly recommends that you consult a safety engineer to be sure that all safety considerations have been addressed.

Several options are available that may assist you in addressing some of these personnel safety concerns, including:

— distribution basin access platforms with ladder and handrail

— ladder extensions (used where the base of the tower is elevated)

— safety cages for fan deck ladders

— external lube lines

— fan cylinder extensions

— access door platform

— motor located outside the tower

— external motor access platform

Tower Location

Space available around the tower should be as generous as possible to promote ease of maintenance—and to permit freedom of airflow into and through the tower. If you have questions about the adequacy of the available space and the intended configuration of the tower, please contact your Marley sales representative for guidance.

Prepare a stable, *level* support foundation for the tower, utilizing weight, wind load, and dimensional information appearing on appropriate Marley submittal drawings. *Supports must be level to insure proper operation of the tower.*

△ Warning

The cooling tower must be located at such distance and direction to avoid the possibility of contaminated tower discharge air being drawn into building fresh air intake ducts. The purchaser should obtain the services of a Licensed Professional Engineer or Registered Architect to certify that the location of the tower is in compliance with applicable air pollution, fire, and clean air codes.

Receiving and Hoisting

Tower Shipment

Unless otherwise specified, NC towers ship by truck (on flat bed trailers), which lets you receive, hoist, and install the tower in one continuous operation. Most single-cell towers ship on one truck. Large modular towers may ship one cell on two trucks. Multicell towers, depending on their size, may require more than one truck.

Responsibility for the condition of the tower upon its arrival belongs to the trucker—as does the coordination of multiple shipments, if required.

Receiving Tower

Prior to unloading the tower from the delivering carrier, inspect the shipment for evidence of damage in transit. If damage is apparent, note the freight bill accordingly. This will support your future recovery claim.

Find and remove the installation instruction drawings and bills of material located in a plastic bag in the cold water basin. This information should be kept for future reference and maintenance purposes.

Hoisting Tower

NC80110, NC80111, and NC80112 models consist of two modules per cell. The upper module includes hoisting clips at the bottom of the module. The hoisting clips on the lower module are also located near the bottom on the sides of the cold water basin. All other models ship in a single module and include hoisting clips located near the bottom of the tower on the cold water basin sides. A ***Hoisting-Installation*** label which has hoisting dimensional information is located on the side casing near the tower centerline. Remove tower from the carrier and hoist into place according to the instructions on the label.

△ Warning

Hoisting clips are provided for ease of unloading and positioning tower. For overhead lifts or where additional safety is required, safety slings should also be placed under the tower. Under no circumstances should you combine the top and bottom modules of modular models and attempt to hoist them at the same time by utilizing the hoisting clips alone!

Installation

Tower Installation

△ Note

These installation instructions are intended to help you prepare before your tower arrives. If discrepancies exist between these instructions and those shipped with the tower, the instructions shipped with the tower will govern.

1. Prior to placement of the tower, confirm that the supporting platform is level, and that the anchor bolt holes are correctly located in accordance with Marley drawings.
2. Place tower (or bottom module of NC80110, NC0111 and NC50112 models) on your prepared supports, aligning anchor bolt holes with those in your supporting steel. Make sure that the orientation agrees with your intended piping arrangement. Attach tower to supporting steel with four 3/4" (19 mm) diameter bolts and flat washers (by others).
3. **NC80110, NC80111, and NC80112 models only.** Before setting top module in place on bottom module, clean any debris from the underside of the top module fill, skid and beams and from the top of the bottom module and remove shipping cover from bottom of top module—replace fasteners at side of module to prevent leaks. Place top module on the top peripheral bearing surface (factory-installed gasket) of bottom module, aligning mating holes as it is set in place. Make sure that the orientation of the top module agrees with your intended piping arrangement. Sections are 180° reversible with respect to each other. Attach top module to bottom module with fasteners provided, according to **"NC Field Installation Manual"** *Assembly Instructions*.

If tower purchased is one fan cell only, ignore steps 4 through 8.

4. If collection basins are to be equalized by the use of Marley standard flumes, unbolt the coverplate from the basin of the cell just installed. The coverplate is located in the center of the basin side.
5. Unbolt temporary coverplate from the basin of the second cell and set second cell (or bottom module of second cell) in place. Align anchor bolt holes and flume openings in basin sides.
6. Install flume according to *Field Installation Manual* instructions.

△ Note

It is important that the cells be firmly anchored before the flume is attached to the second cell.

Installation

7. Repeat steps 2 and 3 for second top section on NC80110, NC80111, and NC80112 models.
8. Repeat steps 4 through 7 for any remaining cells.
9. Attach your cold water supply piping to the cold water basin outlet connection in accordance with drawing instructions, and utilizing gaskets provided by Marley.

△ **Caution**

Do not support your pipe from the tower or outlet connection—support it externally.

Normally, one of the following three outlet arrangements is provided:

Side suction connection: This is a factory-installed, galvanized pipe nipple, extending horizontally from the side of the cold water basin. It is both beveled for welding—and grooved for a mechanical coupling. If a weld connection is used, it is recommended that the weld area be protected against corrosion. Cold galvanizing is suggested, applied according to the manufacturer's instructions.

Bottom outlet connection: This is a factory-installed, circular opening in the cold water basin floor of one or more cells. An appropriately-sized circular opening has been drilled to accept a 125# ANSI B16.1 flat-face flange connection.

Side outlet sump connection: Unless otherwise specified, sumps are manufactured of galvanized or stainless steel construction. Because of their size, they are attached upside down in the basin to prevent damage in shipment. They must be inserted into the square opening prepared in the floor of the cold water basin of one or more cells—sealed against leakage, and attached by machine bolts, according to the installation drawing included. An appropriately-sized circular opening in the vertical face of the sump has been drilled to accept a 125# ANSI B16.1 flat-face flange connection.

10. Attach makeup water supply piping to appropriately-sized float valve connection located in cold water basin side wall. Install the drain and overflow according to the **"NC Field Installation Manual"** *Assembly Instructions*. If you wish to pipe overflow and drain water to a remote discharge point, make those connections at this time also.
11. Install your warm water piping at the inlet location on the tower.

Installation

△ **Note**

Fasteners and components provided by others that are to be attached to the tower must be compatible with the cooling tower materials—i.e. fasteners in a stainless steel cold water basin must be stainless steel.

△ **Caution**

Except for the horizontal components of top-mounted piping, and as prescribed on Marley drawings, do not support your pipe from the tower or inlet connection—support it externally.

Normally, one of the following inlet arrangements is provided:

Standard distribution basin connections: These are circular hot-water inlet openings in the top deck of the tower. On NC80101, NC80103 and NC80104 models a single location is located near the centerline of the tower near the casing side. All other models have two inlet locations on the casing side. Piping inserts vertically into the opening.

Bottom inlet connection (option): An appropriately sized hole and bolt circle–one per cell–is provided in the floor of the cold water basin. Bolt circle is designed to accept a standard 125# flat-face flange.

12. Wire motor in accordance with wiring diagram.

13. Install distribution basin access port covers.

△ **Warning**

For maintenance/safety purposes, Marley recommends a lockout type disconnect switch for all mechanical equipment.
In addition to a disconnect switch, the motor should be wired to main power supply through short circuit protection, and a magnetic starter with overload protection.

Operation

Tower Start-Up

△ **Warning**

Among other sources, outbreaks of Legionnaires' Disease have reportedly been traced to cooling towers. Maintenance and water treatment procedures that prevent amplification and dissemination of Legionella and other airborne bacteria should be formulated and implemented BEFORE systems are operated and continued regularly thereafter to avoid the risk of sickness or death.

Water System:

1. New installations should be cleaned and treated with biocides by a water treatment expert before startup.
2. Remove any and all accumulated debris from tower. Pay particular attention to inside areas of cold water basin, hot water basins, louvers and drift eliminators. Make sure that cold water suction screens are clear and properly installed.
3. For models NC80101, NC80102 and NC80103, fill the water system to an approximate depth of 7" (178 mm) in the depressed area of the cold water basin at the center of the tower. For all other models, fill the water system to an approximate depth of 8" (203 mm). This is the recommended operating water level. Adjust the float valve so that it is 75% open at that level. Continue filling the system until the water reaches a level approximately 1/8" (3 mm) below the lip of the overflow.

△ **Note**

If tower is equipped with a standard side-suction connection, vent accumulated air from the top of the suction hood by removing one or both tap screws provided at that location. Replace these tap screws when venting is complete. (On certain models, the top of the suction hood for 14" (356 mm) diameter side suctions is 1 1/4" (32 mm) above the top of the overflow. In those situations, it is necessary to block the overflow and continue filling the basin to the level where the aforementioned tap screws are submerged before venting.)

4. Start pump(s) and observe system operation. Since the water system external to the tower will have been filled only to the level achieved in the cold water basin, a certain amount of "pump-down" of the basin water level will occur before water completes the circuit and begins to

fall from the fill. The amount of initial pump-down may be insufficient to cause the float valve to open. However, you can check its operation by pressing down on the operating lever to which the stem of the float valve is attached.

Some trial and error adjustment of the float valve may be required to balance the makeup water with tower operation. Ideally, the float valve setting will be such that no water is wasted through the overflow at pump shutdown. However, the water level after pump start-up **must** be deep enough to assure positive pump suction.

5. Check the water level with the UniBasin top deck. Uniform distribution basin depth of 3″ to 5 1/2″ (76 mm to 140 mm) is essential to efficient tower operation. Contact your Marley sales engineer if you are considering a permanent change in circulating water flow rate that would prevent operation within these limits.
6. Continue pump operation for about 15 minutes, after which it is recommended that the water system be drained, flushed, and refilled.
7. While operating the condensing water pump(s) and prior to operating the cooling tower fan, execute one of the two alternative biocidal treatment programs described in the following:
   - Resume treatment with the biocide which had been used prior to shutdown. Utilize the services of the water treatment supplier. Maintain the maximum recommended biocide residual (for the specific biocide) for a sufficient period of time (residual and time will vary with the biocide) to bring the system under good biological control

     or
   - Treat the system with sodium hypochlorite to a level of 4 to 5 mg/L (ppm) free chlorine residual at a pH of 7.0 to 7.6. The chlorine residual must be held at 4 to 5 mg/L (ppm) for six hours, measurable with standard commercial water test kits.

   If the cooling tower has been in operation and then shut down for a duration of time and not drained, perform one of the two previous biocidal treatment programs directly to the cooling water storage vessel (cooling tower sump, drain down tank, etc.) without circulating stagnant water over the cooling tower fill or operating the cooling tower fan.

   After biocidal pretreatment has been successfully completed, cooling water may be circulated over the tower fill with the fan off.

➡

Operation

When biocidal treatment has been maintained at a satisfactory level for at least six hours, the fan may be turned on and the system returned to service. Resume the standard water treatment program, including biocidal treatment.

Mechanical Equipment:

△ **Warning**

Always shut off electrical power to the tower fan motor prior to performing any maintenance on the tower. Any electrical switches should be locked out and tagged out to prevent others from turning the power back on.

1. If equipped, check oil level in accordance with the *Geareducer User Manual* for the Geareducer. (Although the Geareducer was filled to the proper level at the factory, tipping during shipment and hoisting may have caused some loss of oil.) If oil is required, fill Geareducer to the proper level with approved lubricant. (See *Geareducer User Manual*) Check oil level at the Geareducer or dipstick (standpipe located on fan deck, if so equipped) to confirm that the proper level is indicated.
2. Install top fan ring and fan guard according to the installation drawing shipped with the tower. NC80101 and NC80102 models include a single-piece fan guard. All other models include a two-piece fan guard. Models with extended velocity-recovery cylinders do not have fan guards.

△ **Warning**

Improper installation of the fan cylinder and fan guard will destroy the structural integrity of the fan guard. Failure of the fan guard could allow operating or maintenance personnel to fall into the rotating fan.

3. Spin the fan manually to assure that all fan blades properly clear the inside of the fan cylinder. If equipped observe the action of the coupling (or drive shaft couplings) to be sure that the motor and Geareducer are properly aligned. If necessary, correct the alignment in accordance with the included manual.

   For Power Belt Drive equipped models observe the action of the sheaves and belts to be sure that the motor is properly aligned with the fan sheave. See Belt Tensioning and Sheave Alignment on page 20.

Operation

△ Caution

It is essential that the fan cylinder and fan guard be installed in accordance with the Field Installation Manual shipped with the tower. Do not force the fan cylinder out of round.

4. Momentarily bump (energize) the motor and observe rotation of the fan. The fan should rotate in a counterclockwise direction when viewed from below. If rotation is backwards, shut off the fan and reverse two of the three primary leads supplying power to the motor.

△ Caution

If tower is equipped with a two-speed motor, check for proper rotation at both speeds. Check also to see that starter is equipped with a 20 second time delay which prevents direct switching from high speed to low speed. If the fan is intended to be reversed for deicing purposes, make sure that the starter is equipped with a 2 minute time delay between changes of direction. These delays will prevent abnormal stress from being applied to the mechanical equipment and the electrical circuit components.

5. Run the motor and observe the operation of the mechanical equipment. Operation should be stable, and if equipped, there should be no evidence of oil leakage from the Geareducer or oil lines.
6. If equipped with belt drive check the torque on the fan and motor sheave after 10 to 60 hours of operation. See Bushing Fastener Torque Values on page 21.

△ Note

If the water supply system is not being operated—or if there is no heat load on the system—motor amps read at this time may indicate an apparent overload of as much as 10–20%. This is because of the increased density of unheated air flowing through the fan. Determination of an accurate motor load should await the application of the design heat load.

Operation

Tower Operation

General:

The cold water temperature obtained from an operating cooling tower will vary with the following influences:

1. **Heat load:** With the fan in full operation, if the heat load increases, the cold water temperature will rise. If the heat load reduces, the cold water temperature will reduce.

   Note that the number of degrees ("range") through which the tower cools the water is established by the system heat load and the amount of water being circulated, in accordance with the following formula:

$$\text{Range} - °F = \frac{\text{Heat Load (Btu/hr)}}{\text{GPM x 500}}$$

or — in SI units

$$\text{Range} - °C = \frac{\text{Heat Load (kilowatts)}}{\text{Liters/sec x 4.187}}$$

   The cooling tower establishes *only* the cold water temperature attainable under any operating circumstance.

2. **Air wet-bulb temperature:** Cold water temperature will also vary with the wet-bulb temperature of the air entering the louvered faces of the tower. Reduced wet-bulb temperatures will result in colder water temperatures. However, the cold water temperature will not vary to the same extent as the wet-bulb. For example, a 20°F (11 °C) reduction in wet-bulb may result in only a 15°F (8°C) reduction in cold water temperature.

3. **Water flow rate:** Increasing the water flow rate (GPM or L/s) will cause a slight elevation in cold water temperature, while reducing the water flow rate will cause the cold water temperature to decrease slightly. However, at a given heat load (see formula above), water flow reductions *also* cause an increase in the incoming hot water temperature. Use care to prevent the hot water from exceeding 125°F, (52°C) in order to prevent damage to the tower components.

Operation

4. **Air flow rate:** Reducing air flow through the tower causes the cold water temperature to rise. *This is the approved method by which to control leaving water temperature.*

   If your tower is equipped with a single-speed motor, the motor may be shut off when the water temperature becomes too cold. This will cause the water temperature to rise. When the water temperature then becomes too warm for your process, the motor can be restarted.

△ Caution

When operating in this mode care must be taken not to exceed a total acceleration time of 30 seconds per hour.

Fan cycling limits: From a dead stop, determine the number of seconds it takes the fan to arrive at full speed. Divide this number into 30 to determine the allowable number of starts per hour. Considering the normal fan and motor sizes utilized on NC Class towers, anticipate that approximately 4 to 5 starts per hour are allowable.

If your tower is equipped with a two-speed motor, you will enjoy greater opportunity for temperature control. When the water temperature becomes too cold, switching the fan to half-speed will cause the cold water temperature to rise—*stabilizing* at a temperature a few degrees higher than before. With a further reduction in water temperature, the fan may be cycled alternately from half-speed to off—subject to the same constraint of *30 seconds of allowable acceleration time per hour* as outlined above.

If your tower consists of two or more cells, cycling of motors may be shared between cells, increasing your steps of operation accordingly.

Multicell towers equipped with two-speed motors will maximize energy savings and minimize sound levels if fans are staged so that all fans are brought up to low speed before any fan goes to high speed.

For greater insight on cold water temperature control, please read **"Cooling Tower Energy and its Management"**, *Technical Report #H-001-A*, available from your Marley sales representative.

Operation

Wintertime Operation:

The Marley fill system used in NC cooling towers has air entrance louvers that are molded as an integral part of the fill. This feature makes these towers very forgiving of cold weather operation, even at the low temperature and reduced load conditions encountered in free cooling and other low temperature applications. Nevertheless, during operation in subfreezing weather the opportunity exists for ice to form in the colder regions of the tower.

△ **Note**

Slushy, transitory ice forms routinely in the colder regions of the fill of low temperature towers, and is visible through the tower louvers. Such ice normally has no adverse effect on tower operation, but its appearance should be a signal to the operator to undertake ice control procedures.

It is the operator's responsibility to prevent the formation of destructive (hard) ice on the cooling tower fill. Certain guidelines should be followed:

1. *Do not allow the tower's leaving water temperature to drop below a minimum allowable level—say 36°F to 40°F (2°C to 4.5°C). If such low temperature operation is necessary or beneficial to your process, establish the minimum allowable level as follows:*

   During the coldest days of the first winter of operation, observe whether any ice is forming on the louver face, particularly near the bottom part of the louver face. If hard ice is present on the louvers, *you must increase the allowable cold water temperature.* If the coldest possible water is beneficial to your process, ice of a mushy consistency can be tolerated—but routine periodic observation is advisable.

△ **Caution**

If the minimum allowable cold water temperature is established at or near maximum heat load, it should be safe for all operating conditions. However, if established at reduced load, increased heat loads may reintroduce the potential for icing.

Having established the minimum allowable cold water temperature, maintaining that temperature can be accomplished by fan manipulation, as outlined in **Item 4** under **Tower Operation**. However, *in towers of*

more than one cell, where fans are manipulated sequentially, please realize that the water temperature will be significantly lower in the cell or cells operating at the highest fan speed than the net cold water temperature produced by the entire tower would indicate. Wintertime operation of multicell towers at low cold water temperature levels requires that the operator be especially watchful.

2. As cold air enters the louvers, it causes the water flowing over the fill to be drawn inward toward the center of the tower. Thus, under fan operation, the louvers and lower periphery of the tower structure remain partly dry, seeing only random splashing from within the tower—plus normal atmospheric moisture from the entering air. Such lightly wetted areas are most subject to freezing.

   Therefore, if excessive ice forms on the louvers, stop the fan for a few minutes. With the fan off, the water flow will increase in the vicinity of the louvers and reduce the ice buildup.

3. Under extended extreme cold conditions, it may be necessary to operate the fan in reverse. This forces warm air out through the louvers, melting any accumulated ice—adequate heat load must be available. Reversal may be at either full or half speed; however, Marley recommends reversal at half speed. Reverse operation of the fan should be used sparingly and should only be used to control ice, **not** to prevent it. *Reverse fan operation should not need to exceed 1 or 2 minutes.* Monitoring is required to determine the time required to melt accumulated ice.

△ Warning

Reverse operation of fans for prolonged periods during subfreezing weather can cause severe damage to fans and fan cylinders. Ice can accumulate inside fan cylinders at fan blade plane of rotation and fan blade tips will eventually strike this ring of ice, damaging the fan blades or cylinder. Ice can also accumulate on fan blades and be thrown off, damaging fan cylinder or blades. Allow a minimum of 10 minute delay between reverse operation and forward operation during subfreezing weather to permit ice to dissipate from fan blades and fan cylinders. See Fan Drive Caution note on page 12 for fan speed change and reversing precautions.

Operation

4. With no heat load on the circulating water, icing cannot be controlled effectively by air control during freezing weather. ***Towers must not be operated with reduced water rate and/or no heat load during freezing weather.*** If the circulating water system cannot be shut down, water returning from the process should be made to bypass the tower. If a bypass is used, all water must be bypassed without modulation. If the water bypass is directly into the tower's cold water basin, its design must be approved by Marley Engineers.

Intermittent Wintertime Operation:

If periods of shutdown (nights, weekends, etc.) occur during freezing weather, measures must be taken to prevent the water in the cold water basin—and all exposed pipework—from freezing. Several methods are used to combat this, including automatic basin heater systems available from Marley.

△ **Caution**

Unless some means of freeze prevention is incorporated into your system, the tower basin and exposed pipework should be drained at the beginning of each wintertime shutdown period.

It is recommended that you discuss your freeze prevention options with your local Marley sales representative.

Maintenance

Water Treatment and Blowdown

Maintaining Water Quality:

The steel used in NC towers has been galvanized with a heavy zinc coating averaging 2.0 mils in thickness. NC towers are also available in stainless steel. Other materials used (polyethylene basins, PVC fill, drift eliminators, and louvers, aluminum fans and sheaves, cast iron Geareducer, etc.) are selected to offer maximum service life in a "normal" cooling tower environment, defined as follows:

- Circulating water with a pH between 6.5 and 8; a chloride content (as NaCl) below 500 ppm; a sulfate content (SO_4) below 250 ppm; total alkalinity (as $CaCO_3$) below 500 ppm; calcium hardness (as $CaCO_3$) above 50 ppm; a maximum inlet water temperature not to exceed 125°F (51.7°C); no significant contamination with unusual chemicals or foreign substances; and adequate water treatment to minimize scaling.
- Chlorine (if used) shall be added intermittently, with a free residual not to exceed 1 ppm—maintained for short periods. Excessive chlorine levels may deteriorate sealants and other materials of construction.
- An atmosphere surrounding the tower no worse than "moderate industrial", where rainfall and fog are no more than slightly acid, and they do not contain significant chlorides or hydrogen sulfide (H_2S).
- Many proprietary chemicals exist for control of scale, corrosion, and biological growth and should be used prudently. Also, combinations of chemicals may cause reactions which reduce treatment effectiveness, and certain chemicals such as surfactants, biodispersants and antifoams may increase drift rate.

For complete water treatment recommendations and services contact Marley Water Resources, toll free, at 877 800 0929 or contact our local Marley sales representative.

△ **Note**

Unless you purchased the stainless steel structure, your NC tower consists primarily of galvanized steel, therefore your water treatment program must be compatible with zinc. In working with your water treatment supplier, it is important that you recognize the potential effects on zinc of the specific treatment program you choose.

Maintenance

Cooling Tower Cleaning:

△ Warning

Any evaporative-type cooling tower must be thoroughly cleaned on a regular basis to minimize the growth of bacteria, including Legionella Pneumophila, to avoid the risk of sickness or death. Service personnel must wear proper personal protective equipment during decontamination. Do NOT attempt any service unless the fan motor is locked out.

Operators of evaporative cooling equipment, such as water cooling towers, should follow maintenance programs which will reduce to an absolute minimum the opportunity for bacteriological contamination. Public Health Service officials have recommended that "good housekeeping" procedures be followed, such as: regular inspections for concentrations of dirt, scale, and algae; periodic flushing and cleaning; and the following of a complete water treatment program including biocidal treatment.

The visual inspection should take place at least once a week during the operating season. The periodic flushing and cleaning should be done before and after each cooling season, but in any event at least twice a year. The louvers, drift eliminators, and easily accessible fill surfaces should be flushed by use of a moderate-pressure water nozzle, being careful not to cause physical damage. A reliable water treatment program should be installed and maintained. Filtration devices may be employed to reduce the suspended solids concentrations, thus increasing the effectiveness of the water treatment program. See Tower Startup instructions on page 9.

Blowdown:

A cooling tower cools water by continuously causing a portion of it to evaporate. Although the water lost by evaporation is replenished by the makeup system, it exits the tower as pure water—leaving behind its burden of dissolved solids to concentrate in the remaining water. Given no means of control, this increasing concentration of contaminants can reach a very high level.

In order to achieve water quality which is acceptable to the cooling tower (as well as the remainder of your circulating water system), the selected water treatment company must work from a relatively constant level of concentrations. This stabilization of contaminant concentrations is usually accomplished by *blowdown*, which is the constant discharge of a portion of the circulating water to waste. As a rule, acceptable levels on which to base a treatment schedule will be in the range of 2-4 concentrations. The

Maintenance

following table shows the minimum amount of blowdown (percent of flow) required to maintain different concentrations with various cooling ranges*:

Cooling Range	Number of Concentrations						
	1.5X	2.0X	2.5X	3.0X	4.0X	5.0X	6.0X
5° F (2.78° C)	.78	.38	.25	.18	.11	.08	.06
10° F (5.56° C)	1.58	.78	.51	.38	.25	.18	.14
15° F (8.33° C)	2.38	1.18	.78	.58	.38	.28	.22
20° F (11.11° C)	3.18	1.58	1.05	.78	.51	.38	.30
25° F (13.89° C)	3.98	1.98	1.32	.98	.64	.48	.38
Multipliers are based on drift of 0.02% of the circulating water rate.							

* Range = Difference between hot water temperature coming to tower and cold water temperature leaving tower.

EXAMPLE: 700 GPM (44.2 L/s) circulating rate, 18°F (10°C) cooling range. To maintain 4 concentrations, the required blowdown is 0.458% or .00458 times 700 GPM (44.2 L/s), which is 3.2 GPM (0.2 L/s).

If tower is operated at 4 concentrations, circulating water will contain four times as much dissolved solid as the makeup water, assuming none of the solids form scale or are otherwise removed from the system.

△ **Note**

When water treatment chemicals are added, they should not be introduced into the circulating water system via the cold water basin of the cooling tower. Water velocities are lowest at that point, which results in inadequate mixing.

Belt Tensioning

The belts are adjusted by turning the jacking screw at the motor support. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Check tension frequently during the first 24-48 hours of run-in operation. Overtensioning shortens belt and bearing life. Keep belts free from foreign material which may cause slip. Never apply belt dressing as this

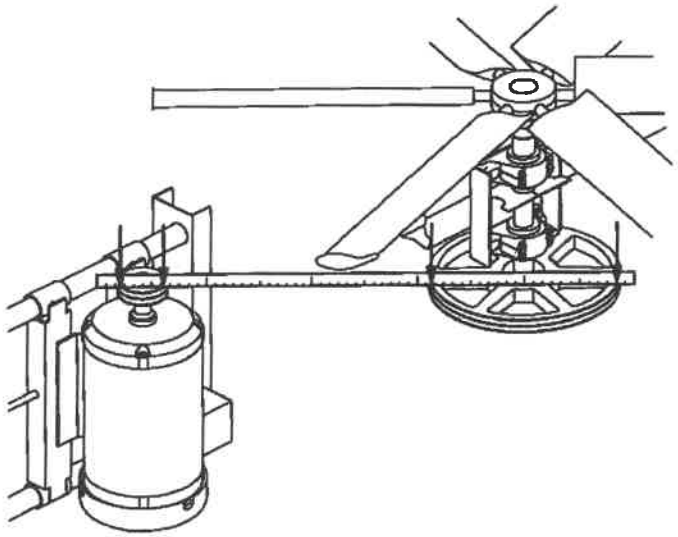
➡

Maintenance

will damage the belt and cause early failure. A Dodge® V-Belt Tension Tester is an alternate method for tensioning V-belts. Check with you local belt supplier.

Sheave Alignment

- The motor sheave is to be positioned as close as possible to the motor in order to minimize torque on the motor bushings.
- The motor and fan sheaves may have grooves that are not used. The bottom surface of the motor and fan sheaves must be aligned within ⅛" of each other and level within ½° (⅛" in 12) in order to not adversely affect belt and sheave life.
- Alignment can be achieved by placing a straight edge across the top of the sheaves making sure that it is level and measuring down to the bottom surface of both sheaves at four points.
- The belt is to be located in the lowest set of grooves.



Bushing Fastener Torque Values

Bushing	Fastener Size	Torque	
		ft· lb;	N· m
SH	¼ - 20	6	8
SDS	¼ - 20	6	8
SD	¼ - 20	6	8
SK	5/16 - 18	13	18
SF	⅜ - 16	22	30
E	½ - 13	35	48
F	9/16 - 12	65	88

Maintenance

Schedule of Tower Maintenance

Some maintenance procedures may require maintenance personnel to enter the tower. Each cased face of the tower has a door for access to the interior of the tower.

△ Warning

The purchaser or owner is responsible for providing a safe method for entering or exiting the access door.

Included with this instruction packet are separate Manuals on each major operating component of the tower, and it is recommended that you read them thoroughly. *Where discrepancies may exist, the separate component User Manuals will take precedence.*

The following is recommended as a minimum routine of scheduled maintenance:

△ Warning

Always shut off electrical power to the tower fan motor prior to performing any inspections that may involve physical contact with the mechanical or electrical equipment in or on the tower. Lock out and tag out any electrical switches to prevent others from turning the power back on. Service personnel must wear proper personal protective clothing and equipment.

Weekly: Inspect for bacterial growth and general operation conditions. Bacterial growth should be reported to your water treatment expert for immediate attention.

Monthly (Weekly at start up): Observe, touch, and listen to the tower. Become accustomed to its normal appearance, sound, and level of vibration. Abnormal aspects relating to the rotating equipment should be considered reason to shut down the tower until the problem can be located and corrected. Observe the operation of the motor, drive train and fan. Become familiar with the normal operating temperature of the motor, as well as the sight and sound of all components as a whole.

If equipped, check for Geareducer oil leaks. Check the Geareducer as well as any optional oil lines to external oil dipstick/sight glass.

Inspect louvers, drift eliminators and basin trash screens and remove any debris or scale which may have accumulated. Replace any damaged or worn out components. Use of high-pressure water may damage the eliminator and louver material.

Maintenance

Observe operation of the float valve. Depress the operating lever to make sure that the valve is operating freely. Inspect the suction screen for plugging. Remove any debris that may have accumulated.

Check for any buildup of silt on the floor of the cold water basin. Make note of the amount, if any, so future inspections will enable you to determine the rate at which it is forming.

Every 3 month: If equipped, lubricate fan shaft bearings. While rotating equipment by hand, grease the bearings until a bead forms around the seals—a maximum charge of 0.55 ounces is recommended. Chevron SRI-2 grease is recommended

Semi-Annually: Relubricate motor according to the manufacturer's instructions. See instructions on this page for towers with the motor located outside the plenum option.

If equipped, check the belt tension and condition.

If equipped, check Geareducer oil level. Shut down the unit and allow 5 minutes for the oil level to stabilize. Add oil if required.

Check to see that all bolts are tight in the fan and mechanical equipment region, including the fan cylinder and fan guard. Refer to component User Manuals for torque values.

Clean and disinfect cooling tower with biocides. Systems with biofouling, high general bacterial counts, or positive cultures of legionella may require additional cleaning. Refer to **"Cooling Tower Cleaning"** section—page 20. Consult your water treatment expert as to prudent biological evaluation testing.

△ **Note**

Geareducer models used on NC cooling towers are designed for 5-year oil change intervals. To maintain five-year change intervals, use only oil designed specifically for these Geareducers. If, after five years, turbine-type mineral oil is used, the oil must be changed semiannually. Refer to the Geareducer Manual for oil recommendations and further instructions.

Annually: Inspect the tower thoroughly, making maximum use of instructions given in the separate service manuals. Check structural bolted connections and tighten as required. Make preventive maintenance repairs as necessary.

Every 5 Years: If equipped, change Geareducer oil. Refer to the *Geareducer User Manual* for instructions.

Maintenance

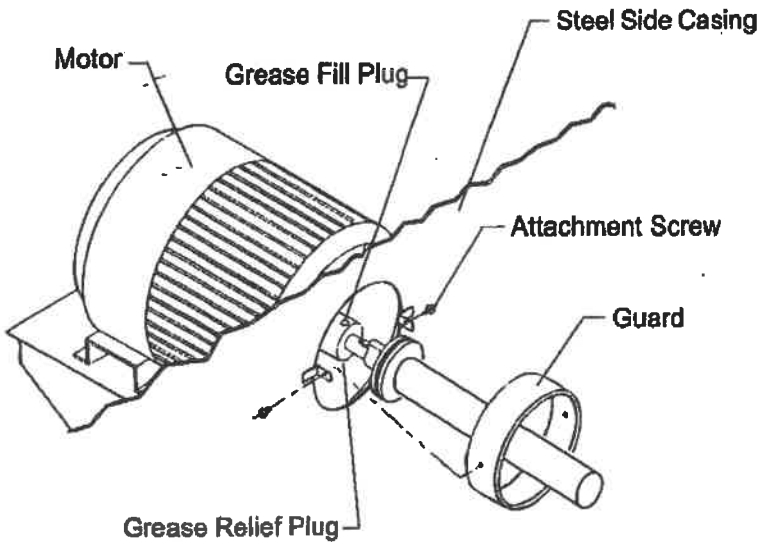
Motor Relubrication Instructions

Motor located outside plenum option

△ **Note**

Open and lock out disconnect switch to make certain motor cannot be started.

1. Remove guard as shown on the next page. Opposite end motor bearing is accessible from outside the tower.



2. Remove grease fill and relief plugs at both shaft extension end and opposite end bearings and remove hardened grease, using clean wire.
3. Insert grease fittings in grease fill openings and add grease until grease is forced out through relief openings.
4. Replace fill plugs and operate mechanical equipment 30 minutes to one hour to purge excess grease at grease relief opening.
5. Reinstall grease relief plugs and reinstall guard.
6. Resume normal tower operation.

Maintenance

Seasonal Shutdown Instructions

When the system is to be shut down for an extended period of time, it is recommended that the entire system (cooling tower, system piping, heat exchangers, etc.) be drained. Leave the basin drains open.

During shutdown, clean the tower (see Warning, page 19) and make any necessary repairs. Pay particular attention to mechanical equipment supports and coupling (or drive shafts).

Following each year's shutdown and cleaning, inspect the tower's metal surfaces for evidence of the need to apply a protective coating. Do not misinterpret grime—and transient rust from the piping system—as a need to have the tower painted. If relatively bright metal can be exposed by cleaning, consider that the galvanizing has remained effective. Unless there is evidence of a generalized failure of the galvanizing, localized touch-up should be all that is required.

△ **Note**

To the extent that the galvanizing (zinc coating) still exists, paint will not adhere to it readily. Contact the manufacturer of the coating you intend to use for instructions.

Tower framework: Check structural bolted connections and tighten as required.

Fans: Check fan assembly bolting and tighten as required. Use torque values prescribed in the Fan User Manual.

Fan shaft bearings: If equipped, lubricate fan shaft bearings at close of each operating season—see page 23.

Electric motors: Clean and lubricate motor at close of each operating season (refer to motor manufacturer's recommendations.) Check motor anchor bolts and tighten as required. See Page 24 for towers with motor located outside the plenum option.

△ **Caution**

Do not start motor before determining that there will be no interference with free rotation of the fan drive.

The motor should be operated for three hours at least once a month. This serves to dry out windings and re-lubricate bearing surfaces (refer to Marley **"Electric Motor User Manual"** *Manual 92-1475*).

Maintenance

At start of new operating season, make sure bearings are adequately lubricated before returning motor to service.

Prolonged Shutdown

If shutdown period is longer than seasonal, contact your Marley sales engineer for additional information.

Marley Services

Marley's interest in your NC cooling tower *does not* end with the sale. Having conceived, designed, and manufactured the most reliable and longest-lasting cooling tower of its class, we want to make sure that you gain the maximum possible benefit from its purchase.

Therefore, the following services are available which are intended to: assure the maximum possible service life under your operating conditions; tailor the operating characteristics to your specific needs; and maintain consistently optimum thermal performance capability. They are available by contacting your Marley sales representative.

Replacement parts: A complete stock of parts and components is maintained at one or more of the various Marley plants. In cases of emergency, they can normally be shipped within 24 hours—by air freight if necessary. However, you would obviously benefit from anticipating your need in advance, thus avoiding the cost of special handling.

Be sure to mention your tower serial number (from the tower nameplate) when ordering parts.

Periodic maintenance: You may wish to contract with Marley for regularly scheduled visits—for the purpose of inspecting and reporting your tower's condition—to make recommendations intended to prevent emergencies—and to perform maintenance considered outside the norm.

This service is not intended to replace the important function performed by your maintenance staff. Their attention assures the tower's routine operating performance, and is invaluable. However, Marley recognizes that the unusual manner in which a cooling tower performs its function—as well as the unique forces which act upon it—may be considerations which occasionally require the services of an expert technician.

Additional Information

Increased load requirements: NC towers are designed so that cells of either equal or unequal capacity can be added in the future. This allows you to compensate for the load increases that normally occur with the replacement or addition of production equipment—and still retain continuity with respect to your cooling tower system.

Tower rebuilding: Marley routinely rebuilds and upgrades cooling towers of *all* materials and manufacture. If your tower ever reaches the limit of its service life, we recommend that you investigate the cost of rebuilding before you routinely order a new replacement tower.

Each NC tower includes a document package containing general orientation drawings, **"NC Field Installation Manual"** *Assembly Instructions*, and tower component manuals. ***These documents contain important information relating to safe installation and operation of the cooling tower.*** Field installation is always required for fan guards, piping inlets and piping outlets. Some optional accessories, such as valves, handrails, ladders and safety cages may also require field installation. If installation details are not covered in the **"NC Field Installation Manual"** a separate installation drawing or manual for each purchased option is included in the document package along with bills of material. If you have purchased an option and can't find the appropriate installation drawing, contact your local Marley office or representative before proceeding.

In addition to these specific documents, Marley publishes numerous technical reports including more detailed information on a variety of cooling tower operation and service topics. Your Marley office or representative will be happy to give you copies of these reports at no charge.

For complete parts and service assistance, contact the Marley sales or representative office in your area. If you need help locating the office nearest you, please phone 800 462 7539 or check the internet at www.marleyct.com.

Troubleshooting

Trouble	Cause	Remedy
Motor Will Not Start	Power not available at motor terminals	• Check power at starter. Correct any bad connections between the control apparatus and the motor.
		• Check starter contacts and control circuit. Reset overloads, close contacts, reset tripped switches or replace failed control switches.
		• If power is not on all leads at starter, make sure overload and short circuit devices are in proper condition.
	Wrong connections	Check motor and control connections against wiring diagrams.
	Low voltage	Check nameplate voltage against power supply. Check voltage at motor terminals.
	Open circuit in motor winding	Check stator windings for open circuits.
	Motor or fan drive stuck	Disconnect motor from load and check motor and Geareducer for cause of problem.
	Rotor defectve	Look for broken bars or rings.
Unusual Motor Noise	Motor running single-phase	Stop motor and attempt to start it. Motor will not start if single-phased. Check wiring, controls, and motor.
	Motor leads connected incorrectly	Check motor connections against wiring diagram on motor.
	Bad bearings	Check lubrication. Replace bad bearings.
	Electrical unbalance	Check voltages and currents of all three lines. Correct if required.
	Air gap not uniform	Check and correct bracket fits or bearing.
	Rotor unbalance	Rebalance.
	Cooling fan hitting end bell guard	Reinstall or replace fan.
Motor Runs Hot	Wrong voltage or unbalanced voltage	Check voltage and current of all three lines against nameplate values.
	Overload	Check fan blade pitch. See Fan Service Manual. Check for drag in fan drive train as from damaged bearings.
	Wrong motor RPM	Check nameplate against power supply. Check RPM of motor and gear ratio.
	Bearings overgreased	Remove grease reliefs. Run motor up to speed to purge excessive grease.
	Wrong lubricant in bearings	Change to proper lubricant. See motor manufacturer's instructions.
	One phase open	Stop motor and attempt to start it. Motor will not start if single-phased. Check wiring, controls, and motor.
	Poor ventilation	Clean motor and check ventilation openings. Allow ample ventilation around motor.
	Winding fault	Check with Ohmmeter.
	Bent motor shaft	Straighten or replace shaft.
	Insufficient grease	Remove plugs and regrease bearings.
	Too frequent starting or speed changes	Limit cumulative acceleration time to a total of 30 seconds/hr. Set on/off or speed change set points farther apart. Consider installing a Marley VFD drive for fine temperature control.
	Deterioration of grease, or foreign material in grease	Flush bearings and relubricate.
	Bearings damaged	Replace bearings.
Motor Does Not Come Up To Speed	Voltage too low at motor terminals because of line drop	Check transformer and setting of taps. Use higher voltage on transformer terminals or reduce loads. Increase wire size or reduce inertia.
	Broken Rotor bars	Look for cracks near the rings. A new rotor may be required. Have motor service person check motor.
Wrong Rotation (Motor)	Wrong sequence of phases	Switch any two of the three motor leads.

Troubleshooting

Trouble	Cause	Remedy
Geareducer Noise	Geareducer bearings	If new, see if noise disappears after one week of operation. Drain, flush, and refill Geareducer. See Geareducer Service Manual. If still noisy, replace.
	Gears	Correct tooth engagement. Replace badly worn gears. Replace gears with broken or damaged teeth.
Unusual Fan Drive Vibration	Loose bolts and cap screws	Tighten all bolts and cap screws on all mechanical equipment and supports.
	Unbalanced drive shaft or worn couplings	Make sure motor and Geareducer shafts are in proper alignment and "match marks" properly matched. Repair or replace worn couplings. Rebalance drive shaft by adding or removing weights from balancing cap screws. See Drive Shaft Service Manual.
	Fan	Make certain all blades are as far from center of fan as safety devices permit. All blades must be pitched the same. See Fan Service Manual. Clean off deposit build-up on blades.
	Worn Geareducer bearings	Check fan and pinion shaft endplay. Replace bearings as necessary.
	Worn fan shaft bearings–belt drive	Check fan shaft endplay. Replace beaings as necessary.
	Unbalanced motor	Disconnect load and operate motor. If motor still vibrates, rebalance rotor.
	Bent Geareducer shaft	Check fan and pinion shaft with dial indicator. Replace if necessary.
Fan Noise	Blade rubbing inside of fan cylinder	Adjust cylinder to provide blade tip clearance.
	Loose bolts in blade clamps	Check and tighten if necessary.
	Fan shaft bearings–belt drive	Grease bearings
Scale or foreign substance in circulating water system	Insufficient blowdown	See "Water Treatment" section of this manual
	Water treatment deficiency	Consult competent water treating specialist. See "Water Treatment" section of this manual
Cold Water Temperature Too Warm (See "Tower Operation")	Entering wet bulb temp. is above design	Check to see if local heat sources are affecting tower. See if surrounding structures are causing recirculation of tower discharge air. Discuss remedy with Marley representative.
	Design wet bulb temp. was too low	May have to increase tower size. Discuss remedy with Marley representative.
	Actual process load greater than design	May have to increase tower size. Discuss remedy with Marley representative.
	Overpumping	Reduce water flow rate over tower to design conditions.
	Tower starved for air	Check motor current and voltage to be sure of correct contract horsepower. Re-pitch fan blades if necessary. Clean louvers, fill and eliminators. Check to see if nearby structures or enclosing walls are obstructing normal airflow to tower. Discuss remedy with Marley representative.
Excessive Drift Exiting Tower	Distribution basins overflowing	Reduce water flow rate over tower to design conditions. Be sure hot water basin nozzles are in place and not plugged.
	Faulty drift elimination	Check to see that integral fill, louvers, and eliminators are clean, free of debris, and installed correctly. If drift eliminators are separate from fill, make sure they are correctly installed in place. Clean if necessary. Replace damaged or worn out components.

Maintenance Schedule

Service	Monthly	Startup	Shutdown	Semi-annually
Inspect General Condition and Operation	x	x		
Observe Operation of:				
Motor, Coupling, Geareducer and Fan	x	x		
Makeup Valve	x	x		
Inspect and Clean as Necessary:				
PVC Air Inlet Louvers	x	x		
PVC Drift Eliminators	x	x		
Cold Water Basin and Outlet	x	x	x	x
Hot Water Basins	x	x		
Fan Motor Exterior	x	x		
Check:				
Cold Water Basin Level	x	x		
Blowdown-adjust as required	x	x		
Check Geareducer for:				
Oil Leaks	x	x		
Proper Oil Level	x	x		
Loose Bolts or Oil Plug		x		x
Plugged Oil Lines or Vent		x		x
Change Geareducer Oil			5-years	
Thoroughly Inspect Mechanical Couplings		x	x	x
Check Belt Drive System for:				
Belt Tension and Condition		x		x
Sheave Bushing Fastener Torque		x		x
Fan Shaft Beang Lubrication (every 3 mo)		x		x
Check and Tighten as Required:				
Mechanical Equipment Bolts		x	x	x
Motor Anchor Bolts		x	x	x
Tower Framework Structural Bolts		x	x	x
Fan Assembly Bolts			x	x
Inspect Metal Surfaces and Touchup			x	
Motor Operation Required (minimum)			3 hrs/month	

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Maintenance Schedule

use this schedule

Service	Monthly	Startup	Shutdown	Semi-annually
Inspect General Condition and Operation	x	x		
Observe Operation of:				
Motor, Coupling, Geareducer and Fan	x	x		
Makeup Valve	x	x		
Inspect and Clean as Necessary:				
PVC Air Inlet Louvers	x	x		
PVC Drift Eliminators	x	x		
Cold Water Basin and Outlet	x	x	x	x
Hot Water Basins	x	x		
Fan Motor Exterior	x	x		
Check:				
Cold Water Basin Level	x	x		
Blowdown-adjust as required	x	x		
Check Geareducer for:				
Oil Leaks	x	x		
Proper Oil Level	x	x		
Loose Bolts or Oil Plug		x		x
Plugged Oil Lines or Vent		x		x
Change Geareducer Oil			5-years	
Thoroughly Inspect Mechanical Couplings		x	x	x
Check Belt Drive System for:				
Belt Tension and Condition		x		x
Sheave Bushing Fastener Torque		x		x
Fan Shaft Beang Lubrication (every 3 mo)		x		x
Check and Tighten as Required:				
Mechanical Equipment Bolts		x	x	x
Motor Anchor Bolts		x	x	x
Tower Framework Structural Bolts		x	x	x
Fan Assembly Bolts		x	x	x
Inspect Metal Surfaces and Touchup		x	x	
Motor Operation Required (minimum)		x	3 hrs/month	

TRANE

Periodic Maintenance

Overview

This section describes the basic chiller preventive maintenance procedures, and recommends the intervals at which these procedures should be performed. Use of a periodic maintenance program is important to ensure the best possible performance and efficiency from a CenTraVac® chiller.

Recommended purge maintenance procedures for the Purifier Purge unit are covered by PRGD-SVU01A-EN or the latest revision which can be obtained at the nearest Trane office.

Record Keeping Forms

An important aspect of the chiller maintenance program is the regular completion of records. Provided at the end of this manual are copies of the "Annual Inspection Check List and Report", "CenTraVac with UCP Commissioning Checklist and "Start-Up Test Log", a "Start-Up Test Log for Water Cooled CenTraVacs with UCP Control Panels" and "UCP "Settings Group" Menu Record". When filled out accurately by the machine operator, the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.

For example, if the machine operator notices a gradual increase in condensing pressure during a month's time, he can systematically check, then correct the possible cause(s) of this condition (fouled condenser tubes, noncondensable in the system, etcetera)

Daily Maintenance and Checks

[ ] Check the chiller's evaporator and condenser pressures, oil tank pressure, differential oil pressure and discharge oil pressure. Compare the readings with the values provided in the Normal Chiller Operating Characteristics table.

IMPORTANT: IT IS HIGHLY RECOMMENDED THAT THE OPERATING LOG BE COMPLETED ON A DAILY BASIS.

CAUTION

Moisture Contamination!

IF FREQUENT PURGING IS REQUIRED, MONITOR PURGE PUMPOUT RATE, IDENTIFY AND CORRECT SOURCE OF AIR OR WATER LEAK AS SOON AS POSSIBLE. Failure to do so can shorten chiller life expectancy, due to moisture contamination caused by leakage.

[ ] Check the oil level in the chiller oil sump using the two sight glasses provided in the oil sump head. When the unit is operating, the oil level should be visible in the lower sight glass.

Periodic Maintenance

⚠ WARNING

Hazardous Voltage w/ Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR

Weekly Maintenance

[ ] Complete all recommended daily maintenance procedures and checks. Complete logs on a daily basis.

Every 3 Months

[ ] Complete all recommended weekly maintenance procedures. Refer to the previous sections for details.

[ ] Clean all water strainers in the CenTraVac water piping system.

Every 6 Months

Normal Chiller Operating Characteristics

Operating Characteristic	Normal Reading
Approx. Evaporator Pressure	(6 to 9 PSIA) (-9 to -6 PSIG)
Approx. Condenser Pressure	(17 TO 27 PSIA) 2 to 12 PSIG (Standard Condensers)
Oil Sump Temperature:	
Unit Not Running	140°F to 145°F (60°C to 63°C)
Unit Running	80°F to 162°F (26.6°C to 72°C)
Differential Oil Pressure	18 to 22 psid

Notes:
1. Condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of HCFC-123 at a temperature above that of leaving condenser water at full load.
2. Normal pressure readings for ASME condensers exceed 12 PSIG.
3. Oil Tank Pressure 12" to 18" HG Discharge Oil Pressure 7 to 15 PSIG.

Periodic Maintenance

[ ] Complete all recommended quarterly maintenance procedures.

[ ] Lubricate the vane control linkage bearings, ball joints, and pivot points; as needed a few drops of light machine oil (SAE-20) is sufficient.

[ ] Lubricate vane operator tang o-rings as described in the maintenance section.

[ ] Lubricate the oil filter shutoff valve o-rings by removing the pipe plug and adding several drops of Trane OIL00022. Replace plug.

[ ] Drain the contents of the rupture disc and purge discharge ventline drip-leg, into an evacuated waste container minimally and more often if the purge is operated excessively.

Also, apply one or two drops of oil on the vane operator shaft and spread it into a very light film; this will protect the shaft from moisture and rust.

Off-Season Maintenance

During those periods of time when the chiller is not operated, be sure the control panel is energized. This is to keep the purge operational, the oil heater warm and will also keep air out of the machine.

Annual Maintenance

Shut down the chiller once each year to check the items listed ; a more detailed inspection checklist is provided on the "Model CVHE, CVHF and CVHG CenTraVac Annual Inspection Checklist and Report" illustrated in this manual.

[ ] Perform the annual maintenance procedures referred to in the Maintenance Section of the purge manual.

[ ] Use an ice water bath to verify that the accuracy of the evaporator refrigerant temperature sensor (4R10) is still within tolerance (+ or - 2.0° at 32°F (1° at 0°C)). If the evaporator refrigerant temperature displayed on the UCP's read-out is outside this 4-degree tolerance range, replace the sensor.

Note: If the sensor is exposed to temperature extremes outside its normal operating range (0°F to 90°F) (-18°C to 32°C), check its accuracy at six-month intervals.

Oil Maintenance

Compressor Oil Change on CVHE, CVHF, CVHG

Recommendations are to subscribe to an annual oil analysis program rather than automatically change the oil as part of scheduled maintenance. Change the oil only if indicated by the oil analysis. Use of an oil analysis program will reduce the chillers overall lifetime waste oil generation and minimize refrigerant emissions. The oil analysis should be performed by a qualified laboratory that is experienced in refrigerant and oil chemistry and in the servicing of Trane centrifugal chillers.

In conjunction with other diagnostics performed by a qualified service technician, oil analyses can provide valuable information on the performance of the chiller to help minimize operating and maintenance costs and maximize it's operating life. A drain fitting is installed in the oil filter top, after the oil filter, for obtaining oil samples.

Note: Use only Trane OIL00022. A full oil change is 9 gallons of OIL00022.

Oil Change Procedure

When oil analysis indicates the need to change compressor oil, use the following procedure for removing oil.

CAUTION

Heater Damage!

The oil sump heater must be deenergized before draining the sump. Failure to do so could possibly burn out the oil sump heater.

[ ] Draw the oil from the chiller through the oil charging valve on the chiller oil sump into an approved, evacuated tank; or,

[ ] Pump the oil from the chiller through the oil charging valve into an airtight resealable container, using a magnetically-driven auxiliary pump.

Forcing the oil from the oil sump by pressurizing the chiller (by raising chiller temperature or adding nitrogen) is not recommended.

Refrigerant dissolved in the oil can be removed and returned to the chiller by using an appropriate deep-vacuum recovery unit and heating and agitating the oil container. Follow all Federal, State and Local regulations with regard to disposal of waste oil.

Oil Maintenance

Replacing Oil Filter

Replace oil filter: (1) annually, (2) at each oil change, (3) or if erratic oil pressure is experienced during chiller operation.

Oil Filter Replacement

Use the following procedure to service the oil filter. Refer to Figure 34.

1. Run the oil pump for two to three minutes to insure that the oil filter is warmed up to the oil sump temperature.
2. Turn the oil pump motor off.
3. Pull the "D" handle on the rotary valve locking pin out of its detent and rotate the valve to the "DRAIN" position. An offset pointer is located on top of the valve with wrench flats to allow turning. The spring force on the locking pin should allow the pin to drop into a detent at this position.
4. Allow at least 15 minutes for the oil to drain from the filter back into the oil sump.
5. Pull the "D" handle to unlock the pin and rotate the valve to the "Change Filter" position. This isolates the filter from the unit. The locking pin should drop into a detent in this position.
6. Remove and replace the filter as quickly as possible. Tighten filter 2/3 to 3/4 turn per instructions written on the filter. Place the used filter in a reusable container. Follow all local, state and federal regulations to dispose of the filter. Pull the "D" handle to unlock the pin and rotate the valve to the "RUN" position. The locking pin should drop into a detent in this position. The chiller is now ready for operation.
7. Purge unit.
8. Check oil pressure 18-27 psi.

Maintenance

Other Maintenance Requirements

Compressors using new seal technology will not use O-rings. The O-ring has been replaced by Loctite 515 applied at a minimum film thickness of .010 applied across the width of the flange. The current jack bolt holes remain for disassembly.

CAUTION

Oil Supply System Problems!

Plugging of oil supply system could lead to bearing failure. Failure to use care could result in Loctite getting into the chiller which may cause problems with the Oil supply system and eductor system.

[ ] Inspect the condenser tubes for fouling; clean if necessary.

⚠ WARNING

Hazardous Voltage w/ Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR

[ ] Measure the compressor motor winding resistance to ground; a qualified service technician should conduct this check to ensure that the findings are properly interpreted.

Contact a qualified service organization to leak-test the chiller; this procedure is especially important if the system requires frequent purging.

[ ] Use a nondestructive tube test to inspect the condenser and evaporator tubes at 3-year intervals.

Note: It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.

[ ] Depending on chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to discern the condition of the compressor and internal components.

Note: (a) Chronic air leaks, which can cause acidic conditions in the compressor oil and result in premature bearing wear; and, (b) Evaporator or condenser water tube leaks. Water mixed with the compressor oil can result in bearing pitting, corrosion, or excessive wear.

[ ] Submit a sample of the compressor oil to a Trane qualified laboratory for comprehensive analysis on an annual basis; this analysis determines system moisture content, acid level and wear metal content of the oil, and can be used as a diagnostic tool.

Lubrication

The only CVHE, CVHF and CVHG chiller component that requires periodic lubrication is the external vane linkage assembly and Rotary oil valve.

Lubricate the vane linkage shaft bearings and rod end bearings as needed with a few drops of light-weight machine oil.

The CenTraVac inlet guide vane tang operators should be serviced annually with R123 compatible grease. Use only Rheolube 734A, available from Trane as LUB00033 (16oz. standard grease gun cartridge) or LUB00063 (3oz. mini grease gun cartridge)

To service the 1st stage tang operator of all units except CVHF extended capacity chillers with 1470 or 1720 compressors.

1. The chiller must be off.
2. Carefully remove any insulation that may have been placed over the two lubrication ports of the tang operator base. This insulation will need to be replaced after the service is complete.
3. Note the position of the tang operator arm, note the placement of spacing washers etc., then disconnect the linkage rod from the tang operator arm. Manually move the tang operator arm and note the amount of effort required to operate the assembly.
4. Loosen but DO NOT REMOVE the 1/16" NPT lubrication port plug that is highest on the assembly.
5. Loosen and remove the remaining lower 1/16" NPT plug.
6. Using a grease gun with an appropriate fitting, insert ONLY Rheolube grease into the open port until clean grease is seen to appear around the threads of the plug in the opposite port.
7. Tighten the plug that was loosened in step 4. Tighten the plug to hand tight plus 1/4 to 1/2 turn.
8. Remove the grease fitting, if used.

Maintenance

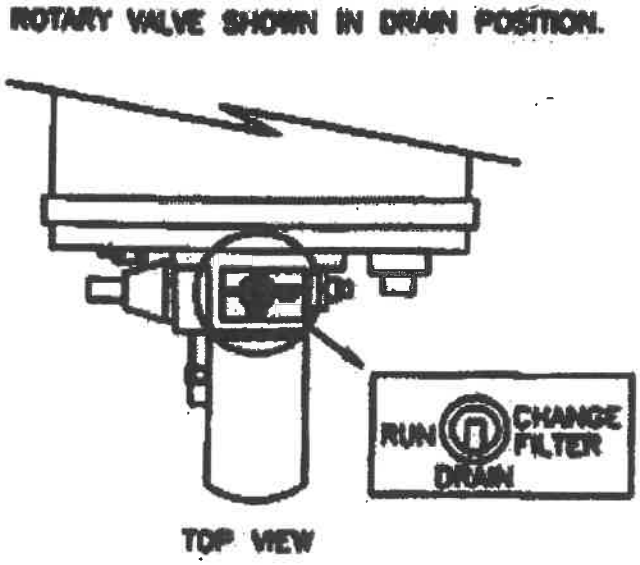
DO NOT LEAVE GREASE FITTINGS INSTALLED.
If grease fittings have been used for this procedure then they MUST BE REMOVED before returning the unit to service. Grease fittings are not vacuum-tight and will become a leak path.

9. Using a clean wooden dowel or other similar tool, remove excess grease from the remaining open lubrication port.
10. Clean and then lightly coat the threads of the plug with Rheolube grease and re-install it into the lubrication port. Tighten the plug to hand tight plus 1/4 to 1/2 turn.
11. Before reconnecting the vane linkage, grasp the tang operator arm and manually operate the vane assembly. If it is now difficult to move, then the tang operator may have become "hydraulically locked" because of excess grease in the assembly. This situation could cause damage to the o-rings of the assembly. If this occurs then remove one of the lubrication plugs, remove some of the grease, then re-install the plug.
12. Reconnect the linkage to the tang operator arm. Ensure the spacer washers between the linkage and the arm are properly placed and that the assembly does not bind. Re-install any insulation that was cut or removed. The unit may be restarted.

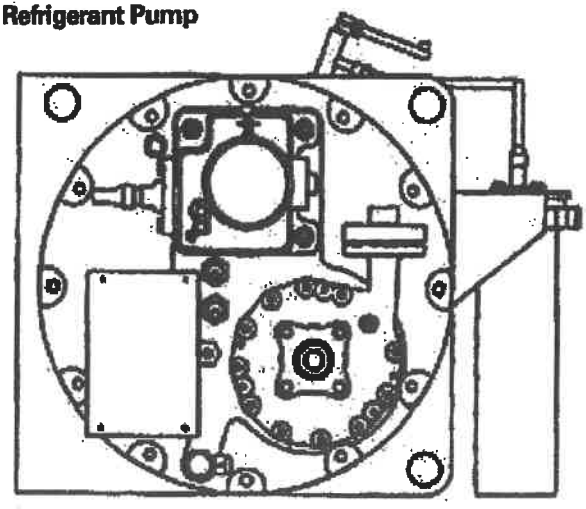
To service the 1st and 2nd stage tang operators on CVHF and CDHF extended capacity chillers with 1470 or 1720 compressors.
The 1st and 2nd stage rotary inlet guide vane tang operators of the extended capacity chillers also require periodic lubrication, at least annually, with R123 compatible Rheolube grease. These actuators have two 1/8" NPT plugs located 180 degrees apart, with one on the top and the other on the bottom of the operator base. Use the same procedure as described above, except that it will be necessary to temporarily disconnect the vane actuators from the tang operator arms in order to test for a "hydraulically locked" condition.

The oil valve block rotary valve uses dual O-Rings to seal to atmosphere. These should be manually lubricated by removing the pipe plug at the valve lubrication port and placing a few drops of Trane OIL00022 in the cavity. Be sure to reinstall the pipe plug when lubrication is completed.

Figure 33. Rotary valve in drain position



Front View with Refrigerant Pump



Maintenance

Refrigerant Charge

⚠ WARNING

Contains Refrigerant!

System contains oil and refrigerant and may be under positive pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.

The refrigerant charging procedure for Trane centrifugal chillers is:

1. If water is present in the tubes, break machine vacuum with refrigerant vapor, or circulate water, to avoid tube damage.
2. Always use refrigerant compatible hoses or copper-tubing with self-sealing connections or shut-off valves.
3. Transfer the refrigerant using one of the following (listed in order of preference):
   a. An approved Trane low-pressure refrigerant recovery and recycle unit.
   b. The available pressure differential.
   c. Gravity. (Use a return vent line to refrigerant drums to equalize pressure.)
5. Do not use dry nitrogen to push refrigerant into the chiller as was common practice in the past. This will contaminate the charge and require excessive purging, which will result in unnecessary release of refrigerant.
6. Weigh in the proper charge.
7. Use recovery and recyle unit or vacuum pump to evacuate hoses; discharge outdoors.
8. If refrigerant is supplied in new returnable cylinders, be sure and refer to General Service Bulletin CVHE-SB-48B for information on returning cylinders. This service bulletin is available at the nearest Trane office.

Depending on the chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to discern the condition of the compressor and internal components.

Note: If your chiller is covered by a Trane extended warranty, the terms of that warranty may require that the procedures listed in the Periodic Maintenance section of this manual be followed for your extended warranty to remain in force. The terms may also require that the chiller be inspected by a Trane authorized warranty agent every 4-years or 40,000 operating hours, whichever occurs first. This inspection will include, at a minimum, a review of the annual inspection checklists and the daily operating logs, as well as performance of a leak test and a general inspection of the chiller. The owner is then required to follow the recommendations made as a result of this inspection at the owners expense.

Maintenance

Recovery and Recycle Connections

To facilitate refrigerant removal and replacement, newer-design CVHE, CVHF and CVHG units are provided with a 3/4-inch vapor fitting with shutoff valve on the chiller suction and with a 3/4-inch liquid connection with shutoff valve at the bottom of the evaporator shell. (Refer to Refrigerant Handling Guidelines.)

Leak Testing

To leak-test a chiller containing full refrigerant charge, raise chiller pressure using a controlled hot water or electric-resistance system to a maximum of 8 psig. Do not use nitrogen, which will cause excessive refrigerant discharge by the purge system.

Cleaning the Condenser

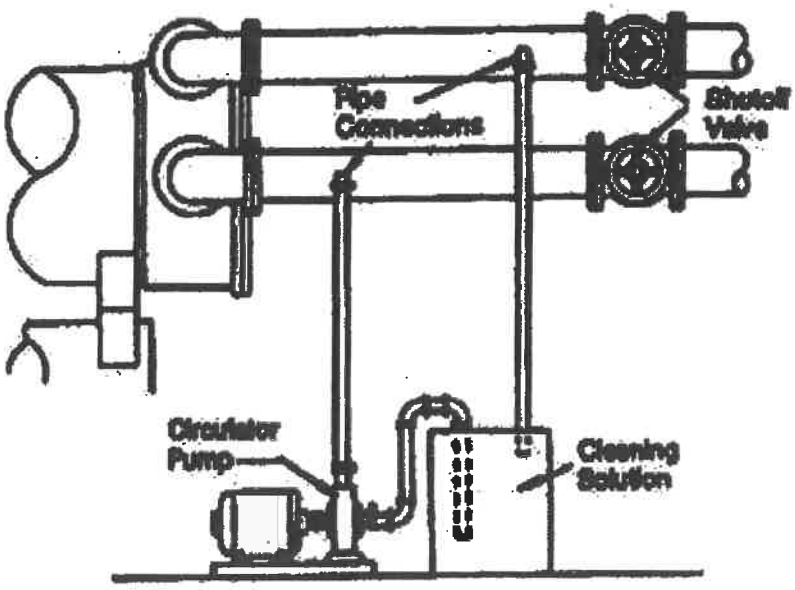
CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water in a CenTraVac may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

See Figure 34 which shows a Typical Chemical Cleaning Setup.

Figure 34 - Typical Chemical Cleaning Setup



Maintenance

Condenser tube fouling is indicated when the approach temperature (the difference between the condensing refrigerant temperature and the leaving condenser water temperature) is higher than predicted.

If the annual condenser tube inspection indicates that the tubes are fouled, two cleaning methods, mechanical and chemical, can be used to rid the tubes of contaminants.

Use the mechanical cleaning method to remove sludge and loose material from smooth-bore tubes.

To clean other types of tubes including internally-enhanced types, consult a qualified service organization for recommendations.

1. Remove the retaining nuts and bolts from the water box covers at each end of the condenser. Use a hoist to lift the covers off the water box. (A threaded connection is provided on each water box cover to allow insertion of an eyebolt).
2. Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.
3. Thoroughly flush the condenser water tubes with clean water.

Scale deposits may be best removed by chemical means. Be sure to consult a qualified chemical house in the area (one familiar with the local water supply's chemical mineral content) for a recommended cleaning solution suitable for the job. Remember, a standard condenser water circuit is composed solely of copper, cast iron and steel.

CAUTION

Unit Corrosion Damage!

Proper procedures must be followed when using corrosive chemicals to clean water side of unit. It is recommended that the services of a qualified chemical cleaning firm be used. Proper personal protective equipment as recommended by the chemical manufacturer should be used. Refer to the chemicals MSDS sheet for proper safety procedures. Failure to follow proper procedures could result in corrosion damage to the unit and tubes.

IMPORTANT: ALL OF THE MATERIALS USED IN THE EXTERNAL CIRCULATION SYSTEM, THE QUANTITY OF THE SOLUTION, THE DURATION OF THE CLEANING PERIOD, AND ANY REQUIRED SAFETY PRECAUTIONS SHOULD BE APPROVED BY THE COMPANY FURNISHING THE MATERIALS OR PERFORMING THE CLEANING.

REMEMBER, HOWEVER, THAT WHENEVER THE CHEMICAL TUBE CLEANING METHOD IS USED, IT MUST BE FOLLOWED UP WITH MECHANICAL TUBE CLEANING, FLUSHING AND INSPECTION.

Cleaning the Evaporator

Since the evaporator is typically part of a closed circuit, it does not accumulate appreciable amounts of scale or sludge. Normally, cleaning every 3 years is sufficient. However, on open CVHE, CVHF and CVHG systems, such as air washers, periodic inspection and cleaning is recommended.

Control Settings and Adjustments

Time delays and safety control cutout settings need to be checked annually. For control calibration and check-out, contact a Trane qualified service organization.

Maintenance

Purge System

Because some sections of the chiller's refrigeration system operate at less-than-atmospheric pressure, the possibility exists that air and moisture may leak into the system. If allowed to accumulate, these noncondensables become trapped in the condenser; this increases condensing pressure and compressor power requirements, and reduces the chiller's efficiency and cooling capacity.

The Trane EarthWise Purge is the only purge system available for the CVHE, CVHF and CVHG chiller. The purge is designed to remove noncondensable gases and water from the refrigeration system. EarthWise Purge unit operation, maintenance and trouble shooting is covered by a separate operation and maintenance manual, which may be obtained from the nearest Trane office.

Overview

This section describes extended storage requirements for UCP installed CVHE, CVHF and CVHG chillers to be removed from service for an undetermined length of time.

Unit Preparation

The following steps are necessary in order to properly prepare a unit for storage.

1. Remove all liquid refrigerant if the unit is charged.

⚠ WARNING

Contains Refrigerant!

System contains oil and refrigerant and may be under positive pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.

2. After the liquid refrigerant is removed, using a recovery or recycle unit or vacuum pump, pull a vacuum to remove remaining refrigerant vapor from the unit.
3. After all traces of refrigerant are out of the unit, a positive nitrogen charge should be put into the unit (6 to 8 psig). This positive pressure must be checked monthly to insure no noncondensables get into the unit. Use a pressure gage on the evaporator shell to verify that the 6 to 8 psig dry nitrogen holding charge is still in the chiller. If this charge has escaped, contact a qualified service organization and the Trane sales engineer that handled the order.
4. The refrigerant charge should be stored in proper refrigerant containers. Due to possible leakage, do not store in used drums.
5. Maintain control power to the control panel. This will maintain oil temperature in the oil sump and the capability of the control panel to present report information. The Chiller Reports should be viewed once a week for normal readings. Any abnormal observation must be reported to the Trane Sales Engineer that handled the order.

Maintenance

⚠ WARNING

Hazardous Voltage w/ Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR

6. Remove the factory installed jumper or the field installed wiring on terminals in the unit control panel. This will prevent unwanted chiller operation.
7. Set the purge operating mode to OFF on UCP chillers.
8. The oil can be left in the unit.
9. The water side should not cause a problem if shut down and drained. There may be slight scaling inside the tubes, but not enough to cause a problem. The customer should inspect and clean tubes before the unit is returned to service.

IMPORTANT: DO NOT USE UNTREATED OR IMPROPERLY TREATED WATER, OR EQUIPMENT DAMAGE MAY OCCUR.

IMPORTANT: SCALE DEPOSITS ARE BEST REMOVED BY CHEMICAL MEANS. BE SURE TO CONSULT ANY QUALIFIED CHEMICAL HOUSE IN THE AREA (ONE FAMILIAR WITH THE LOCAL WATER SUPPLY'S CHEMICAL MINERAL CONTENT) FOR A RECOMMENDED CLEANING SOLUTION SUITABLE FOR THE JOB.

10. Motor bearings: If the motor sits for a long time the bearings could take a set and cause bearing problems or replacement later. Once every six months the chiller oil pump must be started and the compressor motor bump started to rotate the shaft. Contact a qualified service organization to perform this task. If the compressor motor cannot be bump started, then the shaft must be rotated manually by a qualified service organization.
11. Obtain an oil analysis initially after six months of storage, and once each succeeding year. If no oil breakdown is evident do not change the oil. If breakdown is evident, the oil must be replaced.
12. If the unit is stored for more than five years, and the storage is expected to be indefinite, the unit should be examined for leaks every five years from the initial storage date.
13. When the unit is to be returned to service, the services of a qualified service organization should be obtained to conduct all activities associated with the startup of a new chiller.

TRANE

CenTraVac®
Annual Inspection Check List and Report:

Compressor Motor

☐ Motor Continuity check
Good ☐ Open ☐

☐ Check and tighten motor terminals

☐ Meg Motor
Phase 1 ☐ Phase 2 ☐ Phase 3 ☐

☐ Check nameplate rating
Amps ☐

Starter

☐ Check condition of starter contacts
Good ☐ Fair ☐ Replace ☐

☐ Check, tighten if necessary all connections per manufactures specs

Oil Sump

☐ Change oil
If oil analysis, refer to program procedure

☐ Gallons (9) required

☐ Refrigerant/Oil pump motor ground check
Good ☐ Open ☐

☐ Check motor terminal

☐ Change oil filter

Condenser

☐ Visually inspect for scaling in tubes; not findings and make recommendations

Control Circuits

☐ Low refrigerant temperature sensor check
___°F set point ___°F trip point (ice water)

☐ Leaving Evaporator water temperature sensor check-out
___°F set point ___°F trip point (ice water)

☐ Condenser High Pressure Switch check-out
___psig set point
___psig trip point

☐ Check Net Oil Pressure

☐ Check adjustment and operation of inlet guide vane actuator stepper motor
(Note: each machine is unique and must have the full open position number of steps input.)

Leak Test Chiller

☐ Refrigerant and oil analysis for acid content

☐ Sample refrigerant and oil for laboratory analysis (attach a copy of analysis to next monthly inspection report)

Purge Unit

☐ Review the purge operation maintenance manual and follow maintenance and/or inspection items identified.

Comments: _____

_____

_____

_____

Recommendations: _____

_____

_____

_____

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

Proc Folder: 1524853 **Doc Description:** Annual Chiller and Towers Maintenance **Proc Type:** Central Master Agreement	**Reason for Modification:** Addendum No. 2

Date Issued	Solicitation Closes	Solicitation No	Version
2024-10-28	2024-11-06 13:30	CRFQ 0211 GSD2500000007	3

BID RECEIVING LOCATION

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

VENDOR

Vendor Customer Code:

Vendor Name :

Address :

Street :

City :

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

Principal Contact :

Vendor Contact Phone: **Extension:**

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

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

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

ADDITIONAL INFORMATION
Addendum No. 2 - issued to publish the agency responses to vendor questions and move the bid opening date to 11/06/2024 @ 1:30 PM. See attachments. No other changes.

INVOICE TO		SHIP TO	
DEPARTMENT OF ADMINISTRATION		DEPARTMENT OF ADMINISTRATION	
GENERAL SERVICES DIVISION		GENERAL SERVICES DIVISION BLDG 11 - CHILLER PLANT	
103 MICHIGAN AVENUE		218 CALIFORNIA AVE	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Lump Sum Fee for Annual Preventive Maintenance	1.00000	LS		

Comm Code	Manufacturer	Specification	Model #
73161517			

Extended Description:
Lump Sum Fee for Annual Preventive Maintenance - see specifications

INVOICE TO		SHIP TO	
DEPARTMENT OF ADMINISTRATION		DEPARTMENT OF ADMINISTRATION	
GENERAL SERVICES DIVISION		GENERAL SERVICES DIVISION BLDG 11 - CHILLER PLANT	
103 MICHIGAN AVENUE		218 CALIFORNIA AVE	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Hourly Labor Rate	200.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
73161517			

Extended Description:
Corrective Maintenance Hourly Labor Rate - see specifications

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION GENERAL SERVICES DIVISION 103 MICHIGAN AVENUE CHARLESTON WV US	DEPARTMENT OF ADMINISTRATION GENERAL SERVICES DIVISION BLDG 11 - CHILLER PLANT 218 CALIFORNIA AVE CHARLESTON WV US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Total Parts Cost				

Comm Code	Manufacturer	Specification	Model #
73161517			

Extended Description:
Corrective Maintenance Total Parts Cost - see specifications

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Mandatory Pre-bid meeting @ 10:00 AM	2024-10-15
2	Vendor question deadline @ 12: PM	2024-10-17

SOLICITATION NUMBER: CRFQ GSD2500000007
Addendum Number: 2

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

Applicable Addendum Category:

[✔] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[✔] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[ ] Other

Description of Modification to Solicitation:

Addendum is issued to publish and distribute the following information to the Vendor community.

1. To publish the Vendor Technical Questions and Responses, per Attachment A.

2. To move bid opening date to Wednesday, November 6, 2024 @ 1:30 PM

No other changes.

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

Terms and Conditions:

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

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

ATTACHMENT A

Annual Chillers and Towers Maintenance
Vendor Technical Questions and Responses

Q 1. 3.1.1 states that tools and equipment will be provided at no cost, does this include when a crane or similar items are required to complete work?

A 1. 3.1.1 requires work to be performed in accordance with manufacturer's recommendations and specifications. 3.1.3 deals with the Vendor furnishing equipment, tools, etc. This details the typical equipment and tools required to perform preventive maintenance. In the instance that Vendor would need to rent equipment, this would be covered under the "parts" portion of the contract for corrective maintenance.

Q 2. 3.2.2.3 states that vendor must check for excessive vibration for both chillers and towers, is this to be checked by "feel" and sound? Or are real vibration readings from vibration monitoring equipment expected?

A 2. Vibration monitoring equipment will be required.

Q 3. 3.2.4 For clarity, is each of the (4) chillers required to have an oil analysis ran each month for 12 months under this contract?

A 3. Oil analysis is to be performed on a monthly basis for the 4 chillers covered for the life of the contract.

Q 4. 10.2.1 states that no overtime rates may be billed for corrective maintenance. 3.3.3.1 states that there may be requests for emergency service. Will emergency service requests only be placed on weekdays during normal working hours?

A 4. Vendors are to provide an all-inclusive hourly labor rate to cover work to be performed at any time during the life of this contract.

Q 5. Exhibit A#8 states that eddy current testing is to be done on tubes, is this to be performed on both condenser an evaporator tubes? Also, how many chillers are to be tested during the duration of one year?

A 5. Yes, all four in a calendar year, but will likely not be needed until the third year of the contract.

Q 6. Are any of the chillers covered by a warranty for any work recently performed, and if so which chiller or chillers and for how long?

A 6. Chiller # 2 has recently been overhauled and will be covered by warranty during the life of this contract.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CRFQ GSD2500000007

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

☐ Addendum No. 1	☐ Addendum No. 6
☑ Addendum No. 2	☐ Addendum No. 7
☐ Addendum No. 3	☐ Addendum No. 8
☐ Addendum No. 4	☐ Addendum No. 9
☐ 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.

_____
Company

_____
Authorized Signature

_____
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.