

# Project Manual

Bid Package 2  
Addendum No.04  
Volume 2  
Divisions 23

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## Cherokee Nation WILMA P. MANKILLER HEALTH CENTER EXPANSION

Stilwell, Oklahoma

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Division	Section Title	Pages
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**PROCUREMENT AND CONTRACTING DOCUMENTS GROUP**

**SPECIFICATIONS GROUP**

*Facility Services Subgroup*

**DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)**

23 2500 HVAC Water Treatment

7

END OF TABLE OF CONTENTS



## SECTION 23 2500

### HVAC WATER TREATMENT

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following HVAC water-treatment systems:
  - 1. Bypass chemical-feed equipment and controls.
  - 2. Chemical treatment test equipment.
  - 3. HVAC water-treatment chemicals.
  - 4. Glycol feed systems.
  - 5. Antifreeze Solutions.

##### 1.03 DEFINITIONS

- A. EEPROM: Electrically erasable, programmable read-only memory.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
- C. RO: Reverse osmosis.
- D. TDS: Total dissolved solids.
- E. UV: Ultraviolet.

##### 1.04 PERFORMANCE REQUIREMENTS

- A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.
- B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.
- C. Closed hydronic systems, including hot-water heating, chilled water, and glycol cooling, shall have the following water qualities:
  - 1. pH: Maintain a value within 9.0 to 10.5.
  - 2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
  - 3. Boron: Maintain a value within 100 to 200 ppm.
  - 4. Chemical Oxygen Demand (non-glycol systems): Maintain a maximum value of 100 ppm.
  - 5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
  - 6. TDS: Maintain a maximum value of 10 ppm.

7. Ammonia: Maintain a maximum value of 20 ppm.
8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
9. Microbiological Limits:
  - a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/ml.
  - b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/ml.
  - c. Nitrate Reducers: Maintain a maximum value of 100 organisms/ml.
  - d. Sulfate Reducers: Maintain a maximum value of 0 organisms/ml.
  - e. Iron Bacteria: Maintain a maximum value of 0 organisms/ml.

#### **1.05 ACTION SUBMITTALS**

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:
  1. Bypass feeders.
  2. Chemical solution tanks.
  3. Injection pumps.
  4. Chemical test equipment.
  5. Chemical material safety data sheets.
  6. Glycol feed systems.
- B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.
  1. Wiring Diagrams: Power and control wiring.

#### **1.06 INFORMATIONAL SUBMITTALS**

- A. Field quality-control test reports.
- B. Other Informational Submittals:
  1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
  2. Water Analysis: Illustrate water quality available at Project site.

#### **1.07 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

#### **1.08 QUALITY ASSURANCE**

- A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.09 MAINTENANCE SERVICE

- A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for cooling, chilled-water piping heating, hot-water piping, condenser-water piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:
1. Initial water analysis and HVAC water-treatment recommendations.
  2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
  3. Periodic field service and consultation.
  4. Customer report charts and log sheets.
  5. Laboratory technical analysis.
  6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ampion Corp.
  2. Anderson Chemical Co, Inc.
  3. Aqua-Chem, Inc.; Cleaver-Brooks Div.
  4. Barclay Chemical Co.; Water Management, Inc.
  5. Boland Trane Services
  6. GE Betz.
  7. GE Osmonics.
  8. H-O-H Chemicals, Inc.
  9. Metro Group, Inc. (The); Metropolitan Refining Div.
  10. ONDEO Nalco Company.
  11. Watcon, Inc.

### 2.02 MANUAL CHEMICAL-FEED EQUIPMENT

- A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.
1. Capacity: 5 gal.
  2. Minimum Working Pressure: 125 psig.

### 2.03 GLYCOL FEED SYSTEM

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Advantage Controls.
- B. Description:

1. 55 gallon poly tank and painted steel stand.
2. Digital controller with heavy duty NEMA 4X enclosure with gasketed Lexan viewing door.
3. Singel 1/3 hp, 1.5 GPM pump.
4. Schedule 80 PVC piping.
5. Low level switch with audible alarm.
6. Dry contact alarm.
7. Pressure relief valve.
8. Pressure gauge (0-100 psi)
9. 120 VAC, 60 Hz. Prewired unit with 16 AWG 3-wire grounded plug.

#### **2.04 CHEMICALS**

- A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

#### **2.05 ANTIFREEZE SOLUTION**

- A. Propylene Glycol: Dowfrost by Dow Chemical Company with corrosion inhibitors and environmental stabilizer additives to be mixed with water to protect piping circuit and connected equipment from physical damage caused by freezing or corrosion.
- B. Quantity: Sufficient solution for initial system startup and for preventive maintenance for one year from date of Substantial Completion.
- C. Dilution Water: Chloride content shall be less than 25 ppm, sulfate less than 25 ppm, and hardness less than 100 ppm.

### **PART 3 - EXECUTION**

#### **3.01 WATER ANALYSIS**

- A. Perform an analysis of supply water to determine quality of water available at Project site.

#### **3.02 INSTALLATION**

- A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.
- B. Install water testing equipment on wall near water chemical application equipment.
- C. Install interconnecting control wiring for chemical treatment controls and sensors.
- D. Mount sensors and injectors in piping circuits.
- E. Bypass Feeders: Install in closed hydronic systems, including hot-water heating, chilled water, and equipped with the following:
  1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
  2. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
  3. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
  4. Install a swing check on inlet after the isolation valve.

### 3.03 PRE-OPERATIONAL CLEANING

#### A. Closed Systems

1. System Preparation
  - a. Contractor shall flush all systems, including mud from drop legs. Remove, clean and replace all strainers. All systems shall contain the highest quality of water available.
  - b. Complete circulation must be achieved during the cleaning procedure. A minimum flow rate of 2 feet per second shall be maintained to ensure the cleaning chemicals will work properly. All electric, air, and thermostatic operated valves shall be open. All dead end runs shall be looped together with piping not less than 1/3 the size of the run. This piping is to remain in place until the cleaning is complete.
  - c. A minimum of 1 1/2" ball or gate valve is to be permanently installed in the low point of each system for the purpose of draining the system.
  - d. The cleaner shall not require external heat to ensure its effectiveness.
2. Cleaning Procedure
  - a. Add recommended quantity of cleaning chemical directly into the closed loop before the recirculating pumps to ensure rapid mixing and distribution throughout the system. A small amount of antifoam may be added to prevent excessive foaming. Refer to MSDS for safety information.
  - b. Recirculate the system for 16-24 hours.
  - c. Open and drain mud legs and low points periodically during the cleaning process. Drain system completely paying particular attention to mud from drop legs and all low points.
  - d. Refill the system with clean potable water. Clean all strainers. Recirculate for 8-12 hours and completely drain the system.
  - a. Refill the system. The length of time between the completion of the cleaning procedure and the addition of the corrosion inhibitor shall not exceed 24 hours. Test the dilute solution using gas chromatography to verify concentration of glycol, and forward report to Architect (testing equipment for Owner's permanent use is not required).
  - b. Add the recommended level of closed loop inhibitor. The system is now ready for operation.
  - c. A service report shall be generated on-site by the water treatment representative certifying that the system has been cleaned in accordance with the above procedure and shall be copied to the mechanical contractor.

#### B. Water Treatment Service Program

1. Provide start-up service and regular service program visits for a period of one year from start-up, to include:
  - a. Recommendations for installation and system start-up.
  - b. Initial treatment dosages.
  - c. Training of operating personnel on proper feed and control techniques.
  - d. Service visits and consultation meetings as required.
  - e. Provide necessary log sheets and record forms.
  - f. Provide laboratory and technical assistance as required.

### 3.04 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.



- C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Section 23 2113 "Hydronic Piping."
- D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section 23 0523 "General-Duty Valves for HVAC Piping."
- E. Refer to Section 22 1119 "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.
- F. Confirm applicable electrical requirements in electrical Sections for connecting electrical equipment.
- G. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

### **3.05 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Tests and Inspections:
  - 1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
  - 2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
  - 3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
  - 4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
  - 5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
  - 7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
  - 8. Repair leaks and defects with new materials and retest piping until no leaks exist.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Comply with ASTM D 3370 and with the following standards:
  - 1. Silica: ASTM D 859.
  - 2. Steam System: ASTM D 1066.
  - 3. Acidity and Alkalinity: ASTM D 1067.
  - 4. Iron: ASTM D 1068.
  - 5. Water Hardness: ASTM D 1126.

**3.06 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Section 01 7900 "Demonstration and Training."
- B. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

**END OF SECTION**