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SECTION 232500 - HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following HVAC water-treatment systems:
 - 1. Bypass chemical-feed equipment and controls.
 - 2. Biocide chemical-feed equipment and controls.
 - 3. Chemical treatment test equipment.
 - 4. HVAC water-treatment chemicals.
- B. Initial applications of inhibited glycols shall be provided by the Contractor. Other water-treatment chemicals will be provided by MSU Physical Plant Water Treatment Crew.

1.3 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.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:
 - 1. Bypass feeders.
 - 2. Water meters.
 - 3. Controllers.

4. Chemical solution tanks.
 5. Injection pumps.
 6. Chemical test equipment.
 7. Chemical material safety data sheets.
- B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 SCHEDULING

- A. When the system is ready for water treatment, the MSU Physical Plant will be notified. At this point, the system will be turned over to the MSU Physical Plant and the MSU Physical Plant Water Treatment Crew will provide initial application of chemicals. Continued water treatment will be the responsibility of the MSU Physical Plant Water Treatment Crew.
- B. Condenser water systems shall not be operated without treatment. The MSU Physical Plant water treatment crew must be contacted for and present for start-up of the water treatment system and will take over immediately the day-to-day- operation of the system.

PART 2 - PRODUCTS

2.1 MANUAL CHEMICAL-FEED EQUIPMENT

Retain this Article for closed piping systems such as chilled-water and hot-water heating piping.

- 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: 1.5 gal.
 2. Minimum Working Pressure: 125 psig.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Venture VI; Model SF-A-1.5

2.2 AUTOMATIC CHEMICAL-FEED EQUIPMENT

Retain one or more of three paragraphs and associated subparagraphs below. If retaining more than one meter description, indicate where meters are to be installed on Drawings. Open systems and large closed systems, more than 400 gpm (25 L/s), should be equipped with a meter.

A. Automatic Chemical Feed Systems:

1. Description: Include a microprocessor based controller, a water meter with an impulse head, four chemical feed pumps (two biocide, one corrosion inhibitor, one spare), two injection fittings, and an electric solenoid blow down valve, a separate manual adjustable flow control valve in the bleed-off line upstream from the chemical injection points and service valves ahead of the blow down solenoid valves. Factory prepackaged, automatic control units are not acceptable. Plastic body solenoids are not acceptable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aurora Specialty Chemistries.
 - b. Venture VI.

B. Water Meters:

1. Controls: With impulse heads to initiate the timer cycles.
2. Size meters as follows:

REFRIGERATION SYSTEM SIZE	IMPULSE HEAD SIZE
500 tons or larger	100 gallon
100 tons to 499 tons	50 gallon
99 tons or smaller	25 gallon

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Badger.
 - b. Carlon.

C. Controllers:

1. Description: Include conductivity control, temperature monitoring, chemical feed timers, pre-wired connection for water meter, pH control, dual biocide timers, bleed flow alarm, extra dry contact for alarm relay, 4-20 mA isolated output for computer interface for conductivity, and 4-20 mA isolated output for computer interface for pH.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advantage Controls; Microtron Series Model MCPRFB-E.

D. Chemical Feed Pumps:

1. Description: 108 gallon / day pumping capacity, adjustable speed and stroke controls, equipped with safety pressure relief valves.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LMI.

E. Injection Assembly:

1. Quill: Minimum NPS 1/2 (DN 15) with insertion length sufficient to discharge into at least 25 percent of pipe diameter.
2. Ball Valve: Two-piece, stainless steel as described in "Stainless-Steel Pipes and Fittings" Article below; and selected to fit quill.
3. Packing Gland: Mechanical seal on quill of sufficient length to allow quill removal during system operation.
4. Assembly Pressure/Temperature Rating: Minimum 600 psig (4137 kPa) at 200 deg F (93 deg C).

2.3 CHEMICALS

Do not use automotive glycol. Inhibited ethylene glycol is commonly use. Use inhibited propylene glycol in lieu of inhibited ethylene glycol in application where toxic is a concern. Consult MSU EAS. 55 gallon barrel for glycol feed station is not required for systems under 150 gallons in volume.

A. Glycol:

1. For freeze and burst protection of pipes: Inhibited ethylene or propylene glycol-based heat transfer fluids.
2. Minimum concentrations of glycol for freeze protection: 40% by volume.
3. Minimum concentrations of glycol for burst protection: 30% by volume.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. **Ethylene Glycol:** Dow; "Dowtherm SR-1" with pink dye.
 - b. **Ethylene Glycol:** Interstate Chemical "Intercool NFE" with green dye.
 - c. **Propylene Glycol:** Dow; "Dowfrost HD" with yellow dye.
 - d. **Propylene Glycol:** Interstate Chemical; "Intercool NFP" with orange dye.

PART 3 - EXECUTION

3.1 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. Clearly label piping with heat transfer fluid manufacturer, type, and system total fluid volume within 6 feet of point where glycol is added.
- F. Bypass Feeders: Install in closed hydronic systems, including hot-water heating, snow melt, and chilled water, and equipped with the following:
 - 1. Install bypass feeder in a bypass circuit around circulating pumps at a level where they can be easily serviced from floor level, unless otherwise indicated on Drawings.
 - 2. Install a full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
 - 3. Install minimum ½" drain piping piped to nearest floor drain.
 - 4. Install sample line on the service lines to shot feeder.
 - 5. Install a swing check on inlet after the isolation valve.
 - 6. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
- G. Automatic Chemical-Feed Systems: Install in condenser systems, and equipped with the following:
 - 1. Install at a level where they can be easily serviced from floor level. Clearly label all chemical piping.
 - 2. Provide a wall mounted chemical test cabinet with light, and a sink with water supply and drain.
 - 3. Inject chemical into the water system by means of a circulating loop or "side stream" system. Circulating loop piping shall be black steel to within 12" of the conductivity sensor probe, and shall then become schedule 80 PVC for the remaining piping through the treatment station and back to the water system. Piping loop shall have ball type service valves installed to isolate the treatment area. Two injection points shall be installed, a minimum of 24" apart, constructed of PVC components and shall be installed in SCH 80 PVC pipe.
 - 4. A PVC check valve shall be installed in the loop piping between the conductivity probe and the injection points. Install a sample test valve in the loop adjacent to the conductivity probe, ahead of any injection points.
 - 5. Chemical injection lines shall be of flexible polypropylene tubing enclosed in rigid PVC piping with long radius 90 degree elbows. Terminate PVC piping above acid storage tanks and three feet from the injector.
 - 6. Install blowdown solenoid valves at the lowest possible location in the system such as the bottom of the condenser water bundle of the absorption machine.
 - 7. Install water meter in makeup water supply, no higher than 4' above floor.
 - 8. Install test equipment and provide test-kit to Owner. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to 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 Division 23 Section "Common Work Results for HVAC."
- D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section "General-Duty Valves for HVAC Piping."
- E. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.
- F. Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- 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.

3.4 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.

END OF SECTION 232500