SECTION 232500

CHEMICAL WATER TREATMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cleaning of piping systems.

B. Chemical feeder equipment.

C. Chemical treatment.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23 21 13 - Hydronic Piping: Placement of water coupon rack, by-pass (pot) feeder.

1.3 RELATED SECTIONS

A. Section 23 09 13 - Instruments and Control Elements.

B. Section 26 05 05 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.4 REFERENCES

A. NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

A. Submit under the provisions of Division 01.

B. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics, and connection requirements.

C. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

E. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

F. Submit certificate of compliance from authority having jurisdiction indicating approval of chemicals and their proposed disposal.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Submit under the provisions of Division 01.

B. Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

C. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with a minimum of three (3) years' documented experience. The company shall have local representatives with water analysis laboratories and full-time service personnel.

B. Installer: Company specializing in performing the work of this section with a minimum of three (3) years' documented experience and approved by manufacturer.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for to public sewage systems.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of treatment systems for one year from Date of Substantial Completion.

B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detailed findings in writing on proper practices, chemical treatment requirements, and corrective actions needed. Submit two copies of the field service report after each visit.

C. Provide laboratory and technical assistance services during this maintenance period.

D. Include a four-hour training course for operating personnel, instructing them on installation, care, maintenance, testing, and operation of water treatment systems. Arrange course at startup of systems.

E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate the success of water treatment program and make recommendations in writing based upon these inspections.

1.10 MAINTENANCE MATERIALS

A. Provide maintenance materials under the provisions of Division 01.

B. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 MATERIALS

A. System Cleaner:
   1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodium tripoly phosphate and sodium molybdate.
   2. Biocide; chlorine release agents such as sodium hypochlorite or calcium hypochlorite, or microbiocides such as quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

B. Closed System Treatment (Water):
   1. Sequestering agent to reduce deposits and adjust pH, polyphosphate.
   2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
   3. Conductivity enhancers; phosphates or phosphonates.

C. Steam System Treatment:
   1. Sequestering agent to reduce hardness and prevent feedline congestion, phosphate.
   2. Base to provide alkalinity and hydroxide.
   3. Oxygen scavenger; sodium sulfate or hydrazine.
   4. Carbon dioxide neutralizer; volatile amines such as morpholine or cyclohexylamine.
   5. Sludge conditioner.

D. Open System Treatment (Humidifiers):
   1. Sequestering agent to inhibit scaling and corrosion inhibitor, polyphosphate.
   2. Biocide; chlorine release agents such as sodium hypochlorite or calcium hypochlorite, or microbiocides such as quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

2.2 BY-PASS (POT) FEEDER

A. 5.0-gal quick opening cap for working pressure of 175-psig.

2.3 SOLUTION METERING PUMP

A. Positive displacement, diaphragm pump with adjustable flow rate, thermoplastic construction, and continuous-duty fully enclosed electric motor and drive, and built-in relief valve.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.
   2. Cord and Plug: Provide unit with 6-foot cord and plug for connection to electric wiring system including grounding connector.

2.4 SOLUTION TANKS

A. 50-gallon capacity, polyethylene, self-supporting, 5-gallon graduated markings; molded fiberglass cover with recess for mounting pump, agitator, and low-level cutoff with alarm.

2.5 AGITATOR

A. Totally enclosed electric motor, stainless steel clamp and motor mount, 5/8-inch diameter coated Type 316 stainless steel propeller.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.
   2. Cord and Plug: Provide unit with 6-foot cord and plug for connection to electric wiring system including grounding connector.

2.6 LIQUID LEVEL SWITCH

A. Polypropylene housing with integrally mounted PVC air trap, receptacles for connection to metering pump, and low-level alarm and cutoff.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.

2.7 CONDUCTIVITY CONTROLLER

A. Packaged monitor controller with solid state circuiting, five percent accuracy, linear dial adjustment, built-in calibration switch, on-off switch and light, control function light, output to control circuit.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.

2.8 WATER METER

A. Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.

2.9 SOLENOID VALVES

A. Forged brass body globe pattern, normally open or closed as required, general purpose solenoid enclosure, and continuous duty coil.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.

2.10 TIMERS

A. Electronic timers, infinitely adjustable over full range, 150 second- and five-minute range, mounted together in cabinet with hands-off automatic switches and status lights.

B. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.

2.11 WATER SOFTENERS

A. Manufacturers:
   1. Culligan.
   2. Other acceptable manufacturers offering equivalent products.

B. Control: Brass control valve cycled to regenerate from one to twelve-day period.

2.12 TEST EQUIPMENT

A. Provide white enamel test cabinet with local and fluorescent light, capable of accommodating 4 - 10 ml zeroing titrating burettes and associated reagents.

B. Provide the following test kits:
   1. Alkalinity titration test kit.
   2. Sulfite titration test kit.
   3. Total hardness titration test kit.
   4. Low phosphate test kit.
   5. Creosol red pH slide complete with reagent.
   6. Portable electronic conductivity meter.
   7. High nitrite test kit.

PART 3 EXECUTION

3.1 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in an open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.2 CLEANING SEQUENCE

A. Concentration:
   1. As recommended by the manufacturer.
   2. One pound per 100 gallons of water contained in the system.
   3. One pound per 100 gallons of water for hot systems and one pound per 50 gallons of water for cold systems.
   4. Fill steam boilers only with cleaner and water.

B. Hot Water Heating Systems:
   1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
   2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
   3. Circulate for 6 hours at design temperatures, then drain.
   4. Refill with clean water and repeat until system cleaner is removed.

C. Chilled Water Systems:
   1. Circulate for 48 hours, then drain systems as quickly as possible.
   2. Refill with clean water, circulate for 24 hours, then drain.
   3. Refill with clean water and repeat until system cleaner is removed.

D. Steam Systems:
   1. Apply heat, slowly raise boiler temperature to 160 degrees F and maintain for 12 hours minimum.
   2. Cool, then drain as quickly as possible.
   3. Refill with clean water, drain, refill, and check for sludge.
   4. Repeat until the system is free of sludge.
   5. Apply heat to produce steam for piping system and maintain for 8 hours minimum. Bypass traps and waste condensate.

E. Use neutralizer agents on recommendation of system cleaner supplier and approval of Architect/Engineer.

F. Flush open systems with clean water for one hour minimum. Drain completely and refill.

G. Remove, clean, and replace strainer screens.

H. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 INSTALLATION

A. Install in accordance with the manufacturer's instructions.

3.4 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Provide a 3/4-inch water coupon rack around circulating pumps with space for 4 test specimens.

3.5 STEAM SYSTEM TREATMENT

A. Provide bypass feeder on feed water line to each boiler.

B. Provide solution pumps to feed sequestering agent and base from solution tank into boiler. Provide a minimum of one pump per boiler if treatment materials can be mixed. Provide agitator as required.

C. Provide conductivity controller to sample boiler water and operate solenoid blowdown valve. Provide timer activated sampling with solenoid valve, balancing valve, and conductivity probe. Pipe to blowdown tank.

D. Provide a 3/4-inch water coupon rack on each feed water pump with space for 4 test specimens.

E. Provide liquid level switch in each solution tank to de- activate solution pump and agitator, and sound local alarm bell.

3.6 OPEN SYSTEM TREATMENT (HUMIDIFIERS)

A. Provide 1/2-inch bleed-off complete with globe valve piped to drain. Locate bleed-off above flood line. Provide solenoid valve wired to pump.

B. Provide conductivity controller to sample sump water and operate bleed-off solenoid valve and chemical feed pump. Activate with pump. Pipe to drain.

C. Provide a seven (7) day timer and chemical pump to feed biocide automatically.

END OF SECTION