SECTION 232500 - HVAC WATER TREATMENT

1.1 SECTION INCLUDES

A. Qualitative requirements for closed water treatment system for heating hot water, chilled water, geothermal, and heat pump condenser water systems.

B. Qualitative requirements for open water treatment system for cooling tower condenser water systems.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting catalog data, specification data, dimensional and operational data, wiring requirements with diagram, chemical specification data, and warranty data.

1.3 QUALITY ASSURANCE

A. Chemical shall meet all state and local pollution control regulations.

B. Water chemistry and makeup must meet the installed equipment's operational and warranty requirements.

1.4 WARRANTY

A. Provide a 1-year service program including testing and required materials and maintenance.

1. Chemical feed systems shall include all chemicals and additives.

B. Filter media is to be provided as necessary to maintain the required water quality over the installation, start-up, and warranty periods.

1.5 APPLICABLE SYSTEM TYPES

A. Closed Water Treatment Systems

1. Manual bypass chemical feeder.
2. Automatic glycol feeder pump.

B. Open Water Treatment Systems

1. Automatic chemical injection system.
2. Chemical-free Magnetic Field with alternating and reversing polarity field orientation.
3. Chemical-free Pulsed Electric Field.
4. Chemical-free Hydrodynamic Cavitation.

C. Open systems employing a chemical-free water treatment system shall also include a side stream filter and manual bypass chemical feeder for use with initial flushing, cleaning and cooling tower passivation. Bypass feeder shall also be utilized for additional biocide treatment if required by evidence of sampling and testing.

1.6 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. Closed Hydronic Systems shall maintain 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. Conductivity: Maintain a value within 300 to 5,000 S/cm.
4. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
5. Microbiological Limits:

    a. Total Aerobic Plate Count: Maintain a maximum value of 1000 CFU's / ml.
    b. Total Anaerobic Plate Count: Maintain a maximum value of 100 CFU's / ml.
    c. Iron Bacteria: Maintain a maximum value of 0 CFU's/ml.

C. Open Hydronic Systems shall maintain the following water qualities:

1. pH: Maintain a value within 7.2 to 9.4.
2. "P" Alkalinity: Maintain a maximum value of 100 ppm.
3. Conductivity: Maintain a value within 300 to 5,000 S/cm.
4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
5. Free "OH" Alkalinity: Maintain a maximum value of 0 ppm
6. Microbiological Limits:

    a. Total Aerobic Plate Count: Maintain a maximum value of 10,000 CFU's / ml.
    b. Total Anaerobic Plate Count: Maintain a maximum value of 1000 CFU's / ml.
    c. Iron Bacteria: Maintain a maximum value of 0 CFU's/ml.

7. Polymer Testable: Maintain a minimum value within 10 to 40.

D. Passivation for Galvanized Steel: For the first 60 days of operation.

1. pH: Maintain a value within 7 to 8 .
2. Calcium Carbonate Hardness: Maintain a value within 100 to 300 ppm.
3. Calcium Carbonate Alkalinity: Maintain a value within 100 to 300 ppm.

1.7 SYSTEM COMPONENTS

A. Side Stream Filters and Chemical Feeder: Cast iron or steel, 300 psi at 200 degrees F, support legs, 20 micron filter, epoxy-coated, drain valve, spare filter, and spare lid gasket.

B. Conductivity Probe: Provide complete with probe and flow switch and dual flat switch surface carbon elements. Maximum pressure shall not exceed 150 psi and maximum temperature shall not exceed 140 degrees F.

C. Positive-displacement pumps: Provide with ball type check valves, foot valves, and injection fittings.

D. Chemical Solution Tanks: 30 to 50 gallons.

E. Packaged conductivity controller: Electronic operation with bleed and feed relays, feed timer, and

digital display for control setting and adjustments.

F. Cold-water meter: Provide complete with contacting register sized to meter twice the volume of maximum makeup water rate for system.

G. Solenoid valves: Provide and wire as required.

H. Electronic timers: Provide a biocide control timer and lockout control timer.

I. Condenser water treatment control panel: Provide enclosed in a NEMA 4X, IP-65 rated enclosure with hinged lockable cover.

J. Water treatment test equipment

1. Water test kit with spare reagents.
2. Conductivity meter that compensates for differences in temperatures and analog meter.
3. Corrosion test coupon assembly (open systems)

K. Chemicals

1. Provide a minimum of 1 year's supply.
2. Include all MSDS sheets for chemicals provided.

L. Pre-cleaning and flushing materials: Provide chemicals produced specifically for use in cleaning piping systems after installation and prior to being placed into operation.

1.8 INSTALLATION

A. Install side stream filter and chemical feeder with 2 valve bypass and drain.

B. Install make-up water meter with 3-valve bypass, strainer, and unions.

C. Mount conductivity monitor, chemical feed pumps, and biocide timer on 304 stainless steel shelf.

D. Hydronic systems shall not be operated for any reason prior to complete flushing and charging with appropriate chemicals.

1.9 HYDRONIC SYSTEMS FLUSHING AND PRE-CLEANING

A. The following procedures is for flushing and pre-cleaning

1. Determine the metallurgy of the system
2. By-pass all HVAC equipment
3. Determine the exact system volume. This may be accomplished by filling the system through a water meter or salt test.
4. With all areas open to flow, add system cleaner through the By-Pass Filter Feeder or pump per manufacturer's recommendations.
5. Cleaning and flush rates must be at a minimum of 6 ft/sec through the piping or maximum flow rate of the system.
6. First flush the system to remove as much suspended material as possible with clear water.
7. Second, cleaning shall maintain total alkalinity of 3000 ppm for twenty-four (24) to thirty-six (36) hours.
8. Third, flush system until pH and Alkalinity return to make-up water levels and drain
9. Fourth, fill system with OSDM-compliant clean water with a water chemistry (pH, alkalinity,

etc.) and make-up that meets equipment water quality requirements.

a. If the system is drained of water and a heat transfer solution added, a quality corrosion inhibitor shall be added to the system to protect against flash rust while the system is drained. Please consult your water treatment professional for recommendations.

10. Simply draining the loop and refilling with fresh water is not permitted. The loop needs to be flushed by adding fresh water and draining dirty water continuously. This procedure will help prevent foulants from dropping out on the pipe surfaces.

B. ADDITIONAL PROCEDURE FOR GEOTHERMAL SYSTEM FLUSHING AND CLEANING

1. It is imperative that the geothermal piping is sealed and capped during installation to keep debris out. Geothermal systems must be flushed after each stage of the installation.

2. Vertical well piping shall be flushed with high pressure water once they are installed and grouted to remove any debris in the pipe. Piping shall be recapped to prevent sand and dirt from entering the piping before they are connected to the header.

3. Main horizontal header shall be flushed with high pressure water once they are installed to remove any debris in the piping. Piping shall be recapped to prevent sand and dirt from entering the piping until they are connected to the vertical well piping.

4. The entire geothermal piping system shall be cleaned and flushed as indicated above in item A.

5. Architect, Engineer or CM shall signoff on pipe cleaning before system can be started.

1.10 WATER SERVICE PROGRAM

A. The water treatment contractor shall provide maintenance and consulting services for 1 year from date of acceptance of system by the Owner. Minimum service requirements shall include:

1. Monthly sample and testing
2. Additional chemical if needed
3. Side stream filter change
4. Testing of: PH, alkalinity, conductance, inhibitor, microbiological dip slide, and % glycol
5. Visual check of system
6. Written report documenting all of the items above.

1.11 TRAINING

A. Provide training for Owner’s maintenance staff on testing of water samples.

END OF SECTION