SECTION 23.91.89
CHEMICAL TREATMENT FOR HYDRONIC SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY
A. Section Includes: Hydronic piping system flush and clean procedures and chemical water treatment systems including applicable equipment, piping, tubing, interconnection components, electrical controls, water treatment materials, chemical test equipment and cleaning chemicals for cleaning and maintaining treatment of the following mechanical systems.
   1. Hot water boilers and heating water systems.
B. Related Documents:
   1. Drawings and general provisions of the Contract, including General Conditions and Division 1.

1.02 QUALITY ASSURANCE
A. Installing Contractor shall follow the procedures herein, unless alternative procedures are pre-approved by Engineer.
B. Contractor shall provide sufficient chemicals and testing reagents for the initial cleaning, start-up and passivation of all systems.
   1. The Water Treatment supplier will provide direction for proper control equipment and controls sequencing. Submit to Engineer for approval.
   2. The Water Treatment supplier will provide testing services and/or equipment, for measurement of water quality parameters during cleaning and flushing process.
   3. The Water Treatment supplier will provide MSDS (Material Safety Data Sheets) for all furnished chemicals.
C. The Water Treatment supplier will be responsible for water treatment for 1 year from substantial completion (warranty period). The owner shall take over the care of chemical treatment of the systems following warranty period.
D. Refer to drawings for systems which apply to this section.
E. Provide to Owner the name of the competent person who will be injecting the cleaning and water treatment chemicals.
F. If a system must be drained for any reason, it shall be treated immediately upon being refilled.

1.03 SUBMITTALS
A. Submit according to “Submittals Procedures”, indicating specific chemical treatment products and equipment.
   1. Submit operation and maintenance data on all control equipment, chemical feed pumps, timers, water meters, and other applicable equipment including a spare parts list and local suppliers as appropriate.

PART 2 – PRODUCTS

2.01 CHEMICALS – CLOSED WATER SYSTEMS
A. Provide chemical treatment calculations, have the system Engineer review for approval.
B. For initial cleaning of the system, provide a liquid alkaline cleaner.
C. Provide a scale and corrosion inhibitor for final treatment.
2.02 EQUIPMENT REQUIREMENTS
A. All water meters, sample piping, conduit and wire, pot feeders, and valves are contractor furnished and installed. Feed tanks, pumps, chemical treatment panels and other equipment specific to the chemical treatment program are furnished and installed by contractor.
B. The chemical feed tanks and panel shall be located such that there is easy access for maintenance personnel. Minimum floor space is 5 ft by 9 ft for the tanks. Panel shall not be installed directly above the tanks. Typical panel size is 4 ft tall by 8 ft wide. Panel may be installed on a wall or floor mounted system, however proper bracing is necessary.

2.03 EQUIPMENT REQUIRED – CLOSED WATER SYSTEMS
A. Provide a separate chemical by-pass feeder for each closed water system. See drawings for details. The feeder shall contain a stainless steel fiber bag screen, with polypropylene replacement bag filter. Size as specified in the construction drawings.

PART 3 – EXECUTION

3.01 SUPERVISION
A. Installation, start-up and testing of chemical water treatment systems must be provided by the water treatment services specialty contractor personnel.

3.02 CLEANING AND START-UP PROCEDURES - GENERAL
A. Check equipment for proper installation and operation prior to commencing cleaning. Check chemical injection ports to ensure safe and effective introduction of cleaning chemicals and water treatment chemicals.
B. Air handler and terminal unit coils and boilers shall be isolated prior to cleaning and flushing of main distribution piping.
C. Water shall be drained to the sanitary sewer only – draining to the ground or storm sewer is not acceptable.
D. The cleaning and start-up procedures shall commence immediately after the system(s) hydrotesting, and shall be reflected in the commissioning of the systems. The maximum amount of time that a loop can be untreated is 48 hours.
E. Cleaning and flushing shall occur prior to the start-up of boilers.
F. Piping systems shall not remain full of water without proper chemical control for any length of time greater than 48 hours. If cleaning and flushing of the system(s) cannot be accomplished immediately after the hydrotest, the water used for hydrotesting shall be charged with the pretreatment/passivator chemical at a rate determined by the Water Treatment contractor.

3.03 CLEANING AND START-UP PROCEDURES – CLOSED LOOP WATER SYSTEMS (HEATING SYSTEMS)

3.03.01 CLEANING AND FLUSHING PROCEDURE
A. Drain system after hydro-testing.
B. Refill system, close off any 1” or smaller lines (such as coils), and isolate heat exchangers, chillers and boilers. Fill the rest of the system with water. Circulate for one hour. Ensure that all valves (except those supplying smaller legs) are open and that no dead legs are present.
C. Add the cleaning solution (liquid alkaline cleaner) per Water Treatment contractor’s directions.
D. Recirculate for at least 8 hours, preferably overnight and as close to full flow as possible; run number of pumps expected during peak load operation. If possible, heat system to 120°F during circulation. The filter feeder must be installed, with a filter installed, and operating during this step.
**E.** Bleed and feed the entire system immediately after the circulation pumps have been stopped. Add water at the normal feed water location; bleed from the farthest point in the system. Continue the bleed and feed process until the flowing parameters are met:
1. Total Dissolved Solids: <500 uS/cm
2. pH: <7.8
3. Soluble Iron: <0.5 ppm as Fe (optional)
4. Color: No visible color or suspended soils

**F.** Remove, inspect and clean all strainers located in the distribution piping.

**G.** Fill the entire system with water and bleed out any entrained air. Recirculate for one hour.

**H.** Test the system to ensure cleanliness and stability. Required water quality is as follows:
1. Total Dissolved Solids: <500 uS/cm
2. pH: <8.0
3. Soluble Iron: <0.5 ppm as Fe (optional)
4. Color: No visible color or suspended soils

**I.** Open all valves once water quality is acceptable in the above steps.

**J.** Fill entire system, including heat exchangers, chiller(s), boiler(s) and coils.

**K.** Repeat steps D-H for the entire closed loop system(s) if water quality parameters are not met.

### 3.03.02 FINAL TREATMENT PROCEDURE

**A.** Add sufficient inhibitor treatment immediately following flushing and cleaning of the closed loop system(s) per Water Treatment contractor’s directions.

**B.** System circulation should be maintained for at least two weeks after completion of start-up procedures to promote inhibitor effectiveness.

**C.** If a system must be drained for any reason, it shall be treated immediately upon being refilled.

### 3.04 DOCUMENTATION

**A.** Document flushing procedure on the attached checklist and submit for approval.

**END OF SECTION**