CONSTRUCTION STANDARD SPECIFICATION

SECTION 15189

CHEMICAL TREATEMENT FOR HYDRONIC SYSTEMS

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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.

2. Chillers and chilled water systems.

3. Cooling towers and condenser water systems.

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions and Division 1.

2. Where contradictions occur between this Section and Division 1, the more stringent of the two shall apply. The Sandia National Laboratories (SNL) Water Treatment Engineer or Sandia Delegated Representative (SDR) shall determine which is most stringent.

1.02 QUALITY ASSURANCE

A. Installing Contractor shall follow the procedures herein, unless alternative procedures are pre-approved by SDR and SNL Water Treatment Engineer.

B. SNL will provide sufficient chemicals and testing reagents for the initial cleaning, start-up and passivation of all systems.

1. The SNL Water Treatment Engineer and/or Mechanical Systems Engineer will provide direction for proper control equipment and controls sequencing.

2. SNL will provide testing services and/or equipment, for measurement of water quality parameters during cleaning and flushing process.

3. SNL will provide MSDS (Material Safety Data Sheets) for all Sandia furnished chemicals.

C. SNL will take over the care of chemical treatment of the systems as soon as piping systems commissioning is complete or construction completion is achieved, which ever comes first.

D. Refer to standard drawing MP5013STD.dgn for direction on closed water treatment systems equipment and piping installation.

E. Provide to SDR 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. Contact SCO for water treatment chemicals immediately should this happen.

1.03 SUBMITTALS

A. Submit according to Specification 1330 “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 – CONDENSER WATER SYSTEMS

A. SNL will provide a scale and corrosion inhibitor (CW8590 or CW8600) to aid in the general cleanliness of the recirculating water.

B. SNL will provide an oxidizing biocide (SB6300) in liquid form to minimize bacterial activity in the condenser system.

C. If necessary, SNL will provide a non-oxidizing biocide (AQ7423) in liquid form to minimize algal growth. The SNL Water Treatment Engineer will advise on this issue.

2.02 CHEMICALS – CLOSED WATER SYSTEMS

A. Contact SCO (inspector) at least two weeks prior to hydrotesting systems to insure chemicals are onsite for pre-treatment and post-treatment. For chemical treatment calculations, have the system Design Engineer provide an approximate hydronic system volume.

B. For initial cleaning of the system, SNL will provide a liquid alkaline cleaner (CL483).

C. SNL will provide a scale and corrosion inhibitor (CS4015) for final treatment.

2.03 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 SNL 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.

C. Provide ¾" sample line from a weld-o-let on each of the cooling tower pipes. The weld-o-let shall be located on the side or top of the pipe. This line will be routed to the chemical treatment panel area and terminated with a ball valve at 8 ft above the finished floor. Provide insulation and/or heat tape if routed outside or on a perimeter wall. Avoid trapping water in outdoor piping and slope piping to provide self drainage when systems are non-operational. Final connections to chemical treatment panel will be done by others.

1. Provide ¾" copper sample line from cooling tower return pipe.

2. Provide ¾" PVC (sch80) sample line from cooling tower supply pipe.

2.04 EQUIPMENT REQUIRED – CLOSED WATER SYSTEMS

A. Provide a separate chemical by-pass feeder for each closed water system. See standard drawing MP3013STD.dgn for details. The feeder shall be either a 1-gal (FF-50) or a 5-gal Efficiency Dynamics (FF-100) filter feeder capable of: an operating pressure of up to 200°F, and flow up to 40 gpm with a maximum initial pressure drop of 3 psi. 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 witnessed by the SDR and /or SNL water treatment personnel. Contractor shall provide sign-off sheets for all stages as necessary

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, chillers 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 Plan and commissioning schedule. 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 and chillers.

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 SNL Water Treatment Systems Engineer.

3.03 CLEANING, PRETREATMENT AND START-UP PROCEDURES - CONDENSER WATER SYSTEM

3.03.1 GENERAL INFORMATION

A. The automatic conductivity controller shall be calibrated by SNL personnel and the proper operation of the blow-down valve shall be verified prior to the start-up of the condenser system.

B. Do not subject new galvanized towers to alkaline cleaners (recirculating water pH>8.5) or acidic situations (recirculating water pH<6.8) to ensure no corrosion will occur. Galvanized towers will require a special start-up procedure to ensure proper protection of the coating.

3.03.2 CLEANING AND FLUSHING PROCEDURE

A. Verify that coils, heat exchangers, chillers, and boilers are isolated.

B. Fill the entire system with water and recirculate for one hour. Ensure that all valves are open and no dead legs are present. If possible, by-pass the condenser to ensure that no large particles are introduced into the tubes.

C. Drain the entire system at the lowest available point(s). Remove all debris from the tower basin, all screens and strainers.

D. Wash out the tower's internal basin and splash fill.

E. Refill the entire system with water and recirculate for one hour. Ensure that all valves are open and no dead legs are present. If possible, by-pass the condenser to ensure that no large particles are introduced into the condenser tubes.

F. Test the system to ensure cleanliness and stability. Required water quality is as follows:

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

SNL will provide testing services and/or testing equipment. SNL Water Treatment Systems Engineer must accept and sign off on water quality before proceeding. If needed, continue to drain and refill the system until water quality parameters are met.

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

H. Refill the system, including the condenser, with water and begin addition of the appropriate cooling tower chemicals at 2-3 times the normal rate. Begin proper conductivity and chemical control of the tower system. Chemicals will be SNL furnished.

I. Recirculate the system for 24-48 hours without any heat load if possible to ensure proper scale and corrosion protection.

J. Inspect all screens and strainers, clean if necessary.

3.03.3 FINAL TREATMENT PROCEDURE

A. Add inhibitor and biocide immediately, per directions and begin circulation.

B. Maintain system circulation for at least one week after the 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. Contact SCO for water treatment chemicals immediately should this happen.

3.04 CLEANING AND START-UP PROCEDURES – CLOSED LOOP WATER SYSTEMS (CHILLED, HEATING SYSTEMS)

3.04.01 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 SNL Water Treatment Systems Engineer'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. For example, makeup water in the basement and bleed in the penthouse. 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

SNL will provide testing services and/or testing equipment. SNL Water Treatment Systems Engineer must sign off on water quality before proceeding.

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. Re-circulate 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

SNL will provide testing services and/or testing equipment. SNL Water Treatment Systems Engineer must accept and sign off on water quality before proceeding.

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.

3.04.02FINAL TREATMENT PROCEDURE

A. Add sufficient inhibitor treatment immediately following flushing and cleaning of the closed loop system(s) per SNL Water Treatment Engineer'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. Contact the SCO for water treatment chemicals immediately if this should happen.

3.05 DOCUMENTATION

A. Document flushing procedure on the attached checklist and return to the SDR.

- END OF SECTION -

Attachment 1

Turn in records of duration of flushing and cleaning procedure and of treatment chemicals added and any recommendations for improvements to procedures.

System Cleaning & Flushing Checklist

Bldg _____

System (ChW, HW) _____

Initial Flush of System		Date	Responsible Party	Initials
	Isolate condenser, boiler, or chiller if possible		Contractor	
	Isolate all small loops (coils)		Contractor	
	Open all valves and/or circuit setters		Contractor	
	Circulate system for 1 hour minimum		Contractor	
	Drain water to sanitary sewer		Contractor	
	Clean all strainers, filters, and sumps		Contractor	
	Refill system with clean water		Contractor	
Cleaning of System				
	Keep equipment isolated as in initial flush		Contractor	
	Add CL483 to system (SNL SCO to verify)		SNLContractor	
	Install polypropylene filter in pot feeder		Contractor	
	Circulate system for 24 8 hours minimum, 48 hours maximum		Contractor	
	Drain water to sanitary sewer		Contractor	
	Clean all strainers, filters, and sumps		Contractor	
	Refill system with clean water		Contractor	
	Test water to ensure no cleaner (CL483) remains:		SNL	
	pH (less than 7.8)			
	Conductivity (less than 400 uS/cm)			
	Color (clear)			
	Solids (none visible)			
	Iron (less than 2 ppm) optional			
	Repeat drain/refill/test if water quality is unacceptable		Contractor	
Final Treatment of System				
	Add or begin chemical feed to system immediately after cleaning (SNL SCO to verify)		SNLContractor	
	Add CS4015 to ChW or HW system			
	Initiate control of condenser treatment system via chemical treatment panel			

If system is drained for any reason, contact SNL water treatment engineer for chemical addition immediately.