Division 232500
HVAC Water Treatment
DESIGN GUIDE

1 General

1.1 General

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

1.2 Service contract

A. The water treatment scope shall include a one-year service contract for maintaining the building closed loop systems or cooling tower system (if part of the project) for purposes of maintenance of the one-year warranty. Scope includes laboratory and technical assistance services during this maintenance period as well as treatment chemicals. Treatment of campus chilled water, steam, condensate and other campus utility feeds is excluded.

B. Furnish service and maintenance of treatment systems for one (1) year from Date of Substantial Completion.

C. Provide technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to the Mechanical HVAC Manager after each visit.

D. Schedule:
   1. Closed loop systems; a minimum of four visits per year on a quarterly basis for the first one year of warranty.
   2. Cooling Towers and Fluid Cooler Basin Water Systems: monthly visits during the months that the system is operational. Winterize system and drain tower for the winter. Provide start-up for the system in the spring when mechanical cooling is required.

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

1.3 Freeze Protection

A. Campus chilled water and the campus low temperature heating system do not have freeze protection

B. As campus chilled water is not available in the winter months, these systems are not freeze protected with chemicals and are drained annually for the winter season.

C. Heating coils located subject to freezing shall use fifty percent (50%) propylene glycol heating fluid supplied from a separate heat exchanger and pump circulation system.

1. Exception: DOAS coils with heat recovery exceeding 60% efficiency upstream of the coil, may omit glycol providing the following is implemented:

   a. The coil has a circulation pump, hard wired low limit controls, and modulating defrost controls on the heat recovery. Rooftop DOAS units have the circulation pump and the heating valve located within the heated envelope of the building or within the equipment service vestibule.

   b. At ambient temperatures of 38 degrees and lower (or as set), the coil pump shall start and operate continuously at full flow. The temperature of the water at the coil discharge shall be monitored and the valve shall modulate to maintain a minimum of 55 degrees leaving water temperature (or as set) unless more heat is required from the DOAS discharge air temperature controller.

   c. Detection of freezing at the low limit controls shall start the pump, stop the DOAS fans, close the outside air and exhaust dampers and open the heating valve

2 Materials

2.1 Water Treatment Contractors

A. Shall regularly perform treatment services in Ellensburg or towns within 120 miles.

B. Provide list of customers within 120 miles within the last 5 years and references.

C. Have been in the business of water treatment for a minimum of 5 years.

2.2 Central Plant Water Treatment

A. CWU has a long term contract with CH2O for central plant water treatment. This involves very periodic review of other closed loop systems on campus-typically when systems are suspected to have treatment issues.

B. Central Plant Steam. The steam system is actively treated with chemicals that are not suitable for use in direct injection humidification.

C. Central Plant Chilled Water. The campus chilled water system is treated for PH (8 to 8.5) but currently (effective August of 2022) does not have additional treatment. Treatment is not conventionally added at the building level due to open exchange between the building and the campus loop.

D. Central Plant Low Temperature Heating Water. This system is actively treated at the campus central plant.

E. Condenser Water. For water conservation, blow down cycles shall be initiated on conductivity. Blowdowns initiated simply on timers will not be acceptable.

2.3 Building Level Closed Loop Chemical Treatment

A. Systems connected and received water directly from campus systems are not chemically treated at the building level.

B. Closed loop systems in the building either separated from the central utilities with heat exchanger or independent of central utilities shall be treated with corrosion inhibitors for ferrous and not ferrous metals, biocides to prohibit biological growth and a sequestering agent to reduced deposits and control PH.

C. Chemicals

1. Cleaning: CH20 Boil Out Liquid (no substitutions permitted)

2. Treatment

a. Non glycol building closed loop systems not connected to central campus utilities: CH2O 6439 (no substitutions permitted).

b. Glycol building closed loop systems not connected to central campus utilities: Dowfrost HD Propylene Glycol or Interstate Chemical Product P-300

1) Premix propylene glycol with demineralized water. Untreated city water mixed with glycol is not acceptable and will void the warranty of the water treatment.

2) Closed loop heating systems requiring freeze protection shall be treated with 50% solution of propylene glycol.

3) Closed loop chilled water and heat recovery systems requiring burst protection shall be treated with 35% solution of propylene glycol.

4) Glycol shall be introduced via glycol feeder.

2.4 Pot Feeder

A. All closed loop hydronic systems separated from central utilities (glycol and non-glycol) shall be provided with a chemical pot feeder with normally closed isolation valves on either side of the pot feeder.

2.5 Glycol Feeder

A. 50-gallon polyethylene tank on stand with positive displacement pump and integral controls in a NEMA 1 panel. Pressure field adjustable from 0-100 psig.

B. Smaller/less sophisticated automatic glycol feeders may be used for unitary coil applications.

C. Furnish all glycol feeder with auxiliary contacts for low water alarm to building automation system (230900).

2.6 Main Filters

A. Multi-Basket Filter Vessel Construction

1. Multiple 304 S.S. mesh bag baskets in piping in parallel. Quantity as required for flow rate. Gauge taps on inlet and outlet, vent and drain.
2. 150 psi stainless steel housing with stainless steel legs and feet
3. Davit lift cover with seal and swing bolt closures.

B. Filter Bag

1. Polypropylene Felt Filter Bag
2. 10 micron nominal retention
3. Plain Finish
4. Industry standard size #2 (7" diameter x 30.5" length)
5. Retaining ring Style

C. Engineer shall schedule flow rates, size, bag quantity, initial pressure drop and recommended change out pressure drop.

2.7 Side Stream Filters

A. Heavy-duty stainless-steel construction with V-band clamp or swing bolt closures for easy bag changeouts, and stainless-steel compression spring for positive sealing, rated for 150 psig working pressure at 300 degrees, adjustable stainless steel leg assembly. 1/8” perforated stainless steel basket strainer.

B. Filter shall filter down to 10 microns.

C. Filter materials for fluid systems greater than 120 degrees F shall be polypropylene with a metal core.

D. Filter materials for fluid systems up to 120 degrees shall be polypropylene with a polypropylene core.

E. Provide with vent port, gauge ports on clean and dirty side and a drain port.

F. Engineer shall schedule flow rates, size and maximum initial pressure drop.

2.8 Make-Up Water

A. Glycol systems shall introduce make up water through a glycol feeder. Provide low water alarm as previously indicated.

B. Non-glycol systems shall have direct cold water feed with a make-up assembly consisting of isolation valve, RP style backflow preventor by Division 22, and a water meter to meter the amount of fluid make up.

1. Meter shall be provided by Division 22 and shall report flow to the BAS (230900).

3 Execution

3.1 System Volume

A. The water treatment contractor shall meter and measure water capacity of system at initial fill and provide a permanent tag on the water make-up line that indicates the actual measured system volume in gallons. Tags on systems with glycol shall include glycol type and % of glycol solution by volume. Tag shall meet the requirements of Section 230553.

3.2 System Cleaning Flushing

A. General

1. Owner's Representative may choose and direct spot checking of system cleaning via strainer removal & blow-down. Systems not observed to be cleaned shall be re-drained, cleaned and flushed

with appropriate chemicals re-introduced into system. This shall occur at no additional cost to the Owner.

2. Systems shall be operational, filled, hydrostatically tested, started, and vented prior to flushing.

3. Use water meter to record capacity in each system. Record capacity and include in Operation and Maintenance Manuals.

4. Mechanical Contractor shall provide permanent piping connections for cleaning and flushing and provide permanent connection for side stream filter furnished as part of each new capital project.

5. Contractor providing work in this section shall furnish temporary pumps, and temporary bypass filter as required to properly accomplish all cleaning operations.

6. Place all manual and control valves serving main coil banks and terminal control units in open position during cleaning so that circulation through the mains and the runouts is obtained during cleaning.

7. Initially flush the system with cold water through temporary flushing and drain connection. Flushing shall be sufficient to remove all contaminants, such as cuttings, filings, lubricants, rust, scale, grease, solder, flux, welding residue and debris.

B. Heating System

1. After initial flush, apply cleaning chemicals and circulate for a minimum of 24 hours. For heating systems, increase water temperature to 160 degrees minimum during cleaning cycle.

2. Drain systems and immediately refill with clean water and circulate for 6 hours at 160 degrees minimum.

3. Remove heat and circulate to 100 degrees F or less.

4. Quickly drain and then refill with clean water and flush through the flushing and draining connections for a minimum of one hour.

5. Maintain a full system and continue the freshwater flush, operate the circulating pump and partially close and reopen all manual valves several times, operate all automatic control valves through several cycles and continue until there are not further traces of clean compound or evidence of particulate matter in the system.

6. Drain the system. Clean all strainers. This includes strainers upstream of control valves at all coils. Remove start-up strainers at pumps.

C. Chilled Water Systems

1. Completely fill the system with cleaning solution and circulate throughout the system to assure a rapid, efficient clean-up of all suspended solids and foreign material present in the system.

2. Circulate for twenty-four (24) hours, then drain systems as quickly as possible.

3. Refill with clean water and flush via the flushing and draining connections for a minimum one (1) hour duration.

4. Maintaining a full system and continuing the freshwater flush, operate the circulating pump, partially close and reopen all manual valve several times, operate all automatic control valves through several cycles and continue this operation until no further traces of cleaning compound are detected and until there is no evidence of particulate matter in the system.

5. Drain the system. Clean all strainers. This includes strainers upstream of control valves at all coils. Remove start-up strainers at pumps.

D. Steam and Condensate

1. Oils and lubricants in new piping can cause equipment damage in the steam plant and must be thoroughly removed prior to assembly.

2. Flush piping with municipal potable water three times. Do not flush through steam traps. Remove traps and use blowdown points at drip legs for flushing.

3. Water shall be treated with a corrosion inhibitor and detergent that is compatible with piping and steam treatment chemicals.

4. Flush again with clear water to remove residual flushing compound. After this period, have the chemical treatment supplier test each system to ensure that the flushing chemical levels are reduced to a satisfactory level. If not, flush again until chemical levels are acceptable. Chemical inhibitors in the flushing water need to be persistent during the period between hydrotesting/cleaning and system start up.

5. During cleaning, strainers and low points in the system shall be opened for at least 3 minutes every hour.

6. When system is first put into service blow down all strainers and drip legs. Do not allow startup condensate formation to return to steam plant. Provide cooling at condensate discharge prior to disposal down the drains to prevent water in sewer system from exceeding 140 degrees F.

7. After cleaning, steam and condensate lines have to be pressurized with steam within 2 hours after the final flush, so the Owner must be notified in advance of anticipated and again at completion. The Owner warms up the main 100 psi steam lines to the pressure reducing station within the building. If the steam and/or condensate lines cannot be pressurized within the required two (2) hour time period, the lines shall be refilled with clean water and an inhibitor added (to a level of 1000 to 1800 ppm of nitrite). The flushing solution shall be circulated to assure that the interior surfaces of the piping are protected until such time that the lines can be pressurized.

8. Condensate is returned to the campus system only after being approved by the Owner, it is wasted until that time. A sample is drawn at the point where it connects to the main condensate return system, and tested by the Owner, and connected if it is acceptable. Contractor shall provide cool down of condensate during the disposal stage.

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

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

3.3 Treatment

A. Add specified treatment chemicals as soon as possible after cleaning and flushing. Treatment chemicals must be added within two (2) hours of filling system with clean water.

B. Include system water analysis after treatment. Include analysis in Operation and Maintenance Manuals.

3.4 Filters

A. Provide bag filters on campus chilled water systems in each building. Filters shall be located downstream of building pump and upstream of any coil or heater exchanger connection.

B. For other closed loop systems and for the campus low temperature heating system, provide side stream filter. Side stream filter shall be sized for 5% of the peak system flow rate.

C. Provide gauges and isolation valves on either side filter media. Provide taps for monitoring of pressure drop for filter change out by the BAS (230900).

4 Appendix

4.1 Reserved for future.