

**Part 1**  
**General**  
**INTENT**

- .1 This Section specifies services and material required for onsite, cleaning and chemical treatment of a multi-metal, closed loop [hot water heating system] [and] [chilled water system].

**1.2 RELATED SECTIONS**

- .1 Mechanical Spare Parts and Maintenance Materials: Section 23 05 02  
 .2 Chemical Cleaning and Treatment Equipment: Section 23 25 01  
 .3 Chemical Cleaning and Treatment - General Requirements: Section 23 25 02

**1.3 PERFORMANCE REQUIREMENTS**

- .1 Clean hydronic system to remove oil, grease, silt, and rust and leave metal surfaces well passivated.  
 .2 Chemically treat and maintain hydronic system water to meet following standards:

Parameter	Control Limits
Suspended solids:	Nil.
Iron Corrosion Rate:	stable rate, 0.5 mils per year maximum, no pitting.
Copper Corrosion Rate:	stable rate, 0.2 mils per year maximum, no pitting.
Total Iron Concentration:	0.5 mg/L Fe maximum.
Total Copper Concentration:	0.2 mg/L Cu maximum.
Total Plate Count	10 <sup>3</sup> organisms/mL maximum.
PH	8.5 – 9.5, accuracy ±0.1
Conductivity	<2500 µS/cm (micro siemens/cm)

## **1.4 SUBMITTALS**

- .1 In addition to submittal requirements specified in Section 23 25 02, submit a written report of actual cleaning activities including:
  - .1 Times.
  - .2 System status.
  - .3 Problems encountered.
  - .4 Actions taken.
  - .5 Composition of cleaning & spent cleaning solutions.
  - .6 Inspection results.
  - .7 Final concentration of corrosion inhibitor in system.
  - .8 Corrosion coupon weights.
  - .9 Corrosion rates.
  - .10 Final suspended solids concentration in system.
  - .11 Final iron concentration in system.
  - .12 Final copper concentration in system.
  - .13 Final pH.
  - .14 Final conductivity.

## **Part 2 Products**

### **2.1 CLEANING CHEMICALS**

- .1 Cleaning Solution: neutral pH cleaning solution which is capable of removing oil, grease, and rust from metal surfaces of system and passivating cleaned metal surfaces of system. Cleaning solution shall include:
  - .1 Low foaming non-ionic surfactant for penetrating oily and greasy deposit surfaces.
  - .2 Solvent for dissolving oil and grease.
  - .3 Dispersant for dissolving rust.
  - .4 Reducing agent for corrosion control.

- .5 Ferrous and non-ferrous metal corrosion inhibitors.
- .2 Deposit Removal Cleaning Solution: blended neutral pH cleaning solution which is capable of removing scale and iron deposits, destroying bacteria, and passivating the metal surfaces of system.

## **2.2 CHEMICAL TREATMENT MATERIALS**

- .1 Corrosion Inhibitor: containing following:
  - .1 Sulphite based materials for corrosion protection of ferrous material in system.
  - .2 Corrosion inhibitor of non-ferrous material.
  - .3 Buffer for pH level control.

## **2.3 MISCELLANEOUS MATERIALS**

- .1 Corrosion Coupons: supplied by the Minister.
- .2 By-pass Filter Cartridge: sized between 5 and 20 microns for retention of particles greater than 20 microns in diameter.

# **Part 3 Execution**

## **3.1 CLEANING - GENERAL**

- .1 Maintain following conditions during cleaning process:
  - .1 Manual and automatic valves are in full open position.
  - .2 By-pass valves are operated to ensure full flow through entire system.
  - .3 Safety devices, including pressure relief valves, flow switches, and pressure switches are functioning.
  - .4 System is operated with a minimum pressure of 35 kPa(g) at highest point and expansion tank level is maintained at 1/3 to 1/2 full of water.
  - .5 Temporary fine mesh strainers for system pump and control valve strainer baskets are installed and cleaned as required.

## **3.2 CLEANING PROCEDURE**

- .1 Step 1: Fill system with domestic water, establish circulation, and heat system contents to a temperature of 60°C.
- .2 Step 2: After two hours of circulation, collect water samples from at least three different locations in system. If these samples contain suspended solids, clean out strainer baskets, drain system, and repeat steps 1 & 2.

- .3 Step 3: Blend in prepared concentrated cleaning solution, establish circulation, and maintain system temperature at 60°C for at least three days.
- .4 Step 4: Dump spent cleaning solution to disposal, fill system with domestic water, circulate system contents for at least two hours, and dump spent rinse water to disposal.
- .5 Step 5: Fill system with domestic water and repeat step 4 until water samples collected from system are free of oil, grease, and suspended solids.
- .6 Step 6: Drain system completely, including all system low points and perform visual inspections of metal surfaces at three different locations.
- .7 Complete steps 4, 5 & 6 within a 24 hour period.
- .8 If metal surfaces contain oil/grease or silt, fill the system with domestic water and repeat steps 3, 4, 5 & 6.
- .9 Immediately after inspection is completed, install filter cartridge, operating pump and control valve strainers and corrosion coupons, fill system with domestic water, blend in concentrated corrosion inhibitor solution until its concentration in system is at an acceptable level for film formation, and pass system water through by-pass filter and corrosion coupon rack.

### **3.3 DEPOSIT REMOVAL PROCEDURE**

- .1 Step 1: Fill system with domestic water, establish circulation, and heat system contents to a temperature of 60°C;
- .2 Step 2: Blend in prepared concentrated cleaning solution for removal of deposits etc., establish circulation, and maintain system temperature at 60°C until total iron concentration stabilizes;
- .3 Step 3: Dump spent cleaning solution to disposal, fill system with domestic water, circulate system contents for at least two hours, and drain spent rinse water from various locations in system to disposal;
- .4 Step 4: Fill system with domestic water and repeat step 3 until water samples collected from system are free of suspended material;
- .5 Step 5: Drain system and perform visual inspections of metal surfaces at three different locations;
- .6 Complete steps 3, 4, & 5 within a 24 hour period.
- .7 Step 6: If metal surfaces contain scale or iron deposits and are not passivated, fill system with domestic water and repeat steps 2, 3, 4 & 5.

### **3.4 CHEMICAL TREATMENT - CONTROL LIMITS**

- .1 For first month after chemical treatment maintain primary control limits at upper limits.

- .2 Maintain following control limits for inhibitor used in system until Interim Acceptance of the Work:

Inhibitor	Primary Control Limits	Secondary Control Limits
Sulphite	50-100 mg/L SO <sub>3</sub> 80-160 mg/L Na <sub>2</sub> SO <sub>3</sub>	8.5-9.5 pH 2000 mg/L TDS max or 2500 µS/cm (micro siemens/cm)

### 3.5 OPERATION MAINTENANCE UNTIL INTERIM ACCEPTANCE

- .1 Perform following minimum routine maintenance until Interim Acceptance of the Work:
- .1 Maintain control limits specified under “Performance Requirements” and “Chemical Treatment - Control Limits”. Add chemicals as required.
  - .2 Replace fouled filter cartridges in by-pass filter with new filter cartridges as required to maintain continuous flow through filter.
  - .3 Replace iron and copper corrosion coupons with fresh coupons every 30 to 90 days and maintain records of iron and copper corrosion rates.
  - .4 Test water samples of system monthly for following :
    - .1 Visual appearance.
    - .2 pH levels.
    - .3 TDS concentration.
    - .4 Corrosion inhibitor concentration.
    - .5 Total plate count.
  - .2 Document water analyses results, quantities, dates chemicals added and make-up water used on chemical treatment report form.

### 3.6 WASTE WATER DISPOSAL

- .1 Wastewater discharged into a municipal sanitary sewer system from existing or new systems shall be within the limits established by local authorities. Where no local limits have been established, stay within limits specified in “Alberta Infrastructure and Transportation Water Treatment Program Manual, Section I - Environmental Guideline”.

**END OF SECTION**