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**Part 1            General**

**1.1            RELATED SECTIONS**

- .1      Section 22 05 00 - Common Work Results for Plumbing.
- .2      Section 23 05 05 - Installation of Pipework.
- .3      Section 23 05 17 - Pipe Welding.
- .4      Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

**1.2            REFERENCES**

- .1      American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
  - .1      ANSI/ASME B16.5, Pipe Flanges and Flanged Fittings.
  - .2      ANSI/ASME B16.9, Factory Made Wrought Steel Buttwelding Fittings.
  - .3      ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .4      ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .5      ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
  - .6      ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Classes 150, 300, 400, 600, 900, 1500, and 2500.
  - .7      ANSI B16.25, Buttwelding Ends.
- .2      American Society for Testing and Materials International (ASTM).
  - .1      ASTM A105, Standard Specification for Carbon Steel Forgings for Piping Applications.
  - .2      ASTM A182, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
  - .3      ASTM A268/A268M, Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service.
  - .4      ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .5      ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .6      ASTM A312/A312M, Standard Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes.
  - .7      ASTM A403, Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.
  - .8      ASTM B32, Standard Specification for Solder Metal.

- .9 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .10 ASTM F492, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.
- .11 ASTM B283/B283M, Standard Specification for Copper and Copper-Alloy Die Forging (Hot-Pressed).
- .3 American National Standards Institute/American Water Works Association (ANSI/AWWA).
  - .1 ANSI/AWWA B300, Hypochlorites.
  - .2 ANSI/AWWA C111-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - .3 ANSI/AWWA C651, Disinfecting Water Mains.
- .4 American Society of Mechanical Engineers International (ASME)/Association canadienne de normalisation (CSA)/CSA International.
  - .1 ASME A112.18.1/CSA B125.1, Robinets.
- .5 Canadian Standards Association (CSA International).
  - .1 CSA B242-05 (R2011), Groove and Shoulder Type Mechanical Pipe Couplings.
- .6 Manufacturer's standardization Society of the Valves, and Fittings Industry (MSS).
  - .1 MSS-SP-67, Butterfly Valves.
  - .2 MSS-SP-70-1998, Cast Iron Gate Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-71-1997, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  - .4 MSS-SP-72, Ball Valves with Flanged or Butt-Welding Ends for General Service.
  - .5 MSS-SP-80-2003, Bronze Gate, Globe, Angle and Check Valves.
- .7 NSF International/American National Standards Institute (ANSI).
  - .1 NSF/ANSI-61, « Drinking Water System Components - Health Effects ».
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .9 Transport Canada (TC).
  - .1 Law pertaining to the transport of dangerous goods 1992, ch. 34 (LTMD).

### **1.3 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

- .1 Shop drawings must include the following: drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details, and accessories.

**1.4 CLOSEOUT SUBMITTALS:**

- .1 Submit product data and maintenance sheets for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.5 HEALTH AND SAFETY**

- .1 Take necessary measures to ensure health and safety on construction site in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.6 WASTE MANAGEMENT AND REMOVAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic waste in designated containers.
- .5 Manipulate and eliminate hazardous materials in accordance with provincial and municipal regulations.
- .6 Fold up metal and plastic banding, flatten, and place in designated area for recycling.

**1.7 QUALITY ASSURANCE**

- .1 All potable water system components shall conform to NSF 61 Standard.

**1.8 ACCEPTABLE PRODUCTS AND MATERIALS**

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

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## **Part 2            Products**

### **2.1      PIPING**

- .1      Domestic hot, cold and recirculation systems, within building.
  - .1      Above ground:
    - .1      NPS 2 and less: copper tube, hard drawn, type "L", according to ASTM B88M and NSF/ANSI-61 Standards.
    - .2      NPS 2½ and above: Schedule 10, 304L stainless steel according to ASTM and NSF/ANSI-61 Standards.

### **2.2      FITTINGS**

- .1      Copper Pipe:
  - .1      Bronze pipe flanges and flanged fittings, Classes 150 and 300 according to ANSI/ASME B16.24 Standard.
  - .2      Cast bronze threaded fittings, Classes 125 and 250, according to ANSI/ASME B16.15 Standard.
  - .3      Welded cast copper according to ANSI/ASME B16.18 Standard.
  - .4      Forged copper and copper alloys to be welded according to ANSI/ASME B16.22 Standard.
- .2      Stainless Steel Pipe:
  - .1      Welded assembly:
    - .1      Stainless steel connections, schedule 10S, Grade 304/304L, welded ends, in accordance with ASTM A403, Grade WP and ANSI B16.9 Standards.
    - .2      Cast stainless steel flanges, Class 150, with flange ring, welded ends, in accordance with ASTM A182 and ASME/ANSI B16.5, Grade 304/304L Standards.
  - .2      Grooved assembly:
    - .1      Stainless steel connections, schedule 10S, RX roll grooved ends, in accordance with ASTM A403, Grade 304/304L Standard.
    - .2      Galvanized ductile cast iron connections for elements with FX roll grooved ends.
  - .3      Loose flange assembly:
    - .1      Galvanized forged carbon steel flanges, in accordance to ASTM A105 and ASTM B16.5 Standards.
    - .2      Stainless steel « Stub-End » collars, in accordance to ASTM A240, Grade 304/304 L Standard.
    - .3      Unions: Class 3000, forged stainless steel, welded joints, in accordance to ASTM A182 Standard, Grade F304L.

## 2.3 JOINTS

### .1 Copper Pipes:

- .1 Rubber gaskets, 1.6 mm thick: to AWWA C111/A21.11.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, Heavy Series.
- .3 Tin/antimony 95/5 solder, in accordance with ASTM B32, lead content less than 0.2 %.
- .4 Teflon tape: for threaded joints.
- .5 Ductile cast iron couplings, with enameled alkyd coating, copper coloured, for elements with roll grooved ends, in accordance with the CSA B242 Standard, with pads on the lateral bolts to ensure a rigid joint and pre-lubricated EHP gaskets -34°C to 121°C with central tab and in accordance with ASTM D2000; UL approved according to ANSI/NSF 61 Standard to be used with potable cold water at 30°C and hot at 82°C.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner in accordance with ASTM F492 Standard.

### .2 Stainless Steel Pipes:

- .1 Welding: refer to section 23 05 17 – Pipe Welding.
- .2 Stainless steel couplings, for elements with roll grooved ends in accordance with CSA B242, with pads on the lateral bolts to ensure a rigid joint and EPDM gasket -34°C à 110°C with central tab; UL approved according to ANSI/NSF 61 Standard to be used with potable cold water at 30°C and hot at 82°C.
- .3 Bolts, nuts, hex head and washers: to ASTM A307, Heavy Series.

## 2.4 SWING CHECK VALVES FOR COPPER PIPES

### .1 Check valves NPS 2 and under, soldered:

- .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

### .2 Check valve NPS 2 and under, screwed:

- .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
- .2 Acceptable products:
  - .1 Crane No. 37;
  - .2 Nibco No. T 413B;
  - .3 Milwaukee No. 509-T;
  - .4 Toyo-R/W No. 236;
  - .5 Kitz No. 22;
  - .6 Apollo 161 T;
  - .7 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **2.5 SWING CHECK VALVES FOR STAINLESS STEEL PIPES**

- .1 Check valves NPS 2½ and larger, with flanges:
  - .1 Class 150, « Wafer » type stainless steel body, spring washer, stainless steel seat, and Buna-N trim.

## **2.6 BALL VALVES FOR COPPER PIPES**

- .1 Ball valves NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 B283 forged brass or bronze body, solid chromed brass ball, PTFE teflon sealing gasket, packing assembly in brass or by double viton o-ring, PTFE Teflon seat, and steel handle.
  - .3 Acceptable products:
    - .1 Crane No. F9202;
    - .2 Anvil No. F 171 N;
    - .3 Milwaukee No. BA-100;
    - .4 Toyo-R/W No. 5044 A;
    - .5 Kitz No. 58 ;
    - .6 Victaulic, 722 Series;
    - .7 Apollo, 70-100 Series;
    - .8 Replacement materials or products: approved by addendum according to Instructions to bidders.
- .2 Ball valves NPS 2½ and under, soldered:
  - .1 Class 150 in accordance with ANSI/ASME B16.18.
  - .2 B283 forged brass or bronze body, solid chromed brass ball, PTFE teflon sealing gasket, packing assembly in brass or by double viton o-ring, PTFE Teflon seat, and steel handle.
  - .3 Acceptable products:
    - .1 Crane No. F9222;
    - .2 Anvil No. F 171 S;
    - .3 Milwaukee No. BA-150;
    - .4 Toyo-R/W No. 5049 A;
    - .5 Kitz No. 59;
    - .6 Apollo, 70-200 Series;
    - .7 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **2.7 BALL VALVES FOR STAINLESS STEEL PIPES**

- .1 Ball valves, NPS 2½ and over, flanged:
  - .1 Class 150, stainless steel body, stem and ball, flanged ends, normal passage, seat, and trim in Teflon.
  - .2 Acceptable products:
    - .1 Velan No. FB-150;
    - .2 MAS No. F150-SS-F-N;
    - .3 Kitz No. 150UTBZM-N;
    - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.
- .2 Ball valves, NPS 2½ and over, flanged:
  - .1 Class 125/150, epoxy covered ductile cast iron body, stainless steel ball, stainless steel stem, Teflon seat.
  - .2 Acceptable products:
    - .1 American Valve No. 4000D;
    - .2 Apollo, 6Q Series;
    - .3 Replacement materials or products: approved by addendum according to Instructions to bidders.
- .3 Ball valves, NPS 1½ and over, couplings for roll grooved pipes:
  - .1 Grade CF8M stainless steel, 316 stainless steel ball and stem, TFE seat, and fluoroelastomer joints.
  - .2 Acceptable products:
    - .1 Victaulic, 726-S Series (6 800 kPa);
    - .2 Replacement materials or products: approved by addendum according to Instructions to bidders.

## **Part 3 Execution**

### **3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install in accordance with the National Plumbing Code.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.

- .3 Cut pipes square, remove any foreign materials, deburr and clean the extremities, clean the connection assemblies, and join the elements without crimping them.
- .4 Assemble piping using fittings manufactured to ANSI Standards.
- .5 Install piping close to walls and ceilings to reduce overcrowding of space. Group piping and install parallel to walls.
- .6 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

### **3.3 STAINLESS STEEL**

- .1 Clean the cuts and grooves formed by rolling to ensure that there is no black steel residue on the stainless steel.

### **3.4 VALVES**

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

### **3.5 PRESSURE TESTS**

- .1 Conform to requirements of Section 23 05 93 – Testing, adjusting and balancing for HVAC.
- .2 Test Pressure: greater of the maximum system operating pressure or 860 kPa, without pressure loss for two hours.

### **3.6 PRE-START-UP INSPECTIONS**

- .1 Systems to be complete, prior to flushing, testing, and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

### **3.7 RINSING AND DISINFECTION**

- .1 Use sodium hypochlorite according to ANSI/AWWA B300 Standard, to disinfect the water distribution network.
- .2 Proceed with the disinfection of the water distribution network in accordance with ANSI/AWWA C651.



- .3 Flushing and disinfection must be performed by a specialised contractor in the presence of the Departmental Representative. Inform the Departmental Representative 4 days prior to starting the disinfection work.
- .4 Inject potable rinsing water inside the main pipe by the available outlets, at a flow rate sufficient to ensure a water speed of 1.5 m/s, for a period of ten minutes or until all foreign material has been flushed and the water runs clear at the discharge.
- .5 Supply and install pumps and connections as required to perform the rinsing.
- .6 Open the valves of the main pipe and branches to ensure a complete flushing. Close the valves when the flushing is complete.
- .7 Once the flushing has been finished and approved by the Departmental Representative, inject, inside the pipe, a concentrated chlorine solution, approved by the Departmental Representative and ensure that it is distributed to the entire network.
- .8 The quantity of injected chlorine must be proportional to the amount of water that enters the pipe.
- .9 Inject the chlorine at a location close to the supply point of the main pipe at the same time that the pipe is filling with water.
- .10 Operate valves and connected accessories while the pipe contains the chlorine.
- .11 Wait 24 hours, then inject water into the pipe to drain the chlorine solution.
- .12 Measure the quantity of residual chlorine at the extremity of the network farthest from the point of testing.
- .13 Once drained of the chlorine solution, perform bacteriological tests on the network.
  - .1 Take daily samples for a minimum of two days.
  - .2 If the contamination persists or reappears, proceed with another round of disinfection of the network until the water is of drinking quality.
  - .3 The specialized Contractor must submit a certified copy of the analysis results.
- .14 Take water samples from the branch lines at regular intervals, to verify the quantity of residual chlorine in the water.
- .15 Once the residual chlorine levels reach at least 50 ppm, leave the chlorine solution in the network for 24 hours.
  - .1 After 24 hours, take new samples to ensure that residual chlorine in the pipes is at least 10 ppm.

### **3.8 START-UP**

- .1 Timing: start up after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
  - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up Procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Bring HWS storage tank up to design temperature slowly.
  - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
  - .5 Check control, limit, and safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

### **3.9 PERFORMANCE VERIFICATION**

- .1 Scheduling:
  - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
  - .1 Verify that flow rate and pressure meet Design Criteria.
  - .2 Test, adjust and balance the hot water recirculation network in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .3 Adjust pressure regulating valves while withdrawal is at maximum and inlet pressure is at minimum.
  - .4 Sterilize HWS and HWC systems for Legionella control.
  - .5 Verify performance of temperature controls.
  - .6 Verify compliance with safety and health requirements.
  - .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
  - .8 Confirm water quality consistent with supply Standards, and ensure no residuals remain as result of flushing or cleaning.

- .3 Reports:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
  - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

**3.10 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**