

## **PART 1        GENERAL**

### **1.1        REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15 (Latest Edition), Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18 (Latest Edition), Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22 (Latest Edition), Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .4 ANSI/ASME B16.24 (Latest Edition), Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
  - .5 ASME B16.26 (Latest Edition), Cast Copper Alloy Fittings for Flared Copper Tubes.
  - .6 ASME B31.9 (Latest Edition), Building Services Piping.
  - .7 ASME B36.19M (Latest Edition), Stainless Steel Pipe.
- .2 ASTM International
  - .1 ASTM A 182/A 182M (Latest Edition), Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
  - .2 ASTM A 269 (Latest Edition), Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A 307 (Latest Edition), Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .4 ASTM A 312/A 312M (Latest Edition), Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
  - .5 ASTM A 351/A 351M (Latest Edition), Castings, Austenitic, for Pressure Containing Parts.
  - .6 ASTM A 403/A 403M (Latest Edition), Wrought Austenitic Stainless Steel Piping Fittings.
  - .7 ASTM A 536 (Latest Edition), Standard Specification for Ductile Iron Castings.
  - .8 ASTM B 32 (Latest Edition), Standard Specification for Solder Metal.
  - .9 ASTM B 42 (Latest Edition), Seamless Copper Tube, Standard Sizes.
  - .10 ASTM B 88M (Latest Edition), Standard Specification for Seamless Copper Water Tube (Metric).
  - .11 ASTM F 876 (Latest Edition), Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
  - .12 ASTM F 877 (Latest Edition), Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)

- .1 ANSI/AWWA C111/A21.11 (Latest Edition), Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 ANSI/AWWA C151/A21.51 (Latest Edition), Ductile Iron Pipe, Centrifugally Cast, for Water.
- .3 AWWA C904 (Latest Edition), Crosslinked Polyethylene (PEX) Pressure Pipe, ½ In. (12 mm) through 3 In. (76mm), for Water Service.
- .4 CSA Group
  - .1 CSA B137.5 (Latest Edition), Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
  - .2 CSA B242 (Latest Edition), Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC S101 (Latest Edition), Fire Endurance Tests of Buildings Construction and Materials.
  - .2 CAN/ULC S102.2 (Latest Edition), Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.
  - .3 CAN/ULC S115 (Latest Edition), Standard Method of Fire Tests of Firestop.
- .6 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67 (Latest Edition), Butterfly Valves.
  - .2 MSS-SP-71 (Latest Edition), Gray Iron Swing Check Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-80 (Latest Edition), Bronze Gate, Globe, Angle and Check Valves.
- .9 National Research Council (NRC)
  - .1 National Plumbing Code of Canada (NPC).
- .10 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, c. 34 (TDGA).

## **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Closeout Submittals:
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Division 01 - General Requirements.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

## **PART 2 PRODUCTS**

### **2.1 PIPING - COPPER**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
  - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

### **2.2 PIPING - PLASTIC**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground: NPS ½ to 4 CPVC to SDR11 with IPS outside dimensions: CSA B 137.6, ASTM D1784 cell class of 24448 and NSF 61.
  - .2 Buried or embedded: Up to NPS 3: PEX Tubing to ASTM F876 and F877 and certified to NSF61 rated at 93° at 551 kPa, 82°C at 690 kPa, 23°C at 1100 kPa, certified to be used for hot or cold water service.

### **2.3 FITTINGS - COPPER**

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger:
  - .1 cast bronze to ANSI/ASME B16.18 or wrought copper to ANSI/ASME B16.22 roll grooved to CSA B242.
  - .2 Fittings to be manufactured to copper-tube dimensions. Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.
- .6 NPS 1½ and smaller:

- .1 wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components, EPDM seals, and push-to-connect or press fit joints for hard drawn copper tube type L or K. Suitable for operating pressure to 1380 kPa at ASTM B88.

## **2.4 FITTINGS - PLASTIC**

- .1 CPVC Fittings: to CSA B137.6, ASTM D1784 Cell Class of 23447 and NSF 61.
- .2 CPVC Flanges: to ASTM F1970 and ASTM D2467.
  - .1 Flanged CPVC: 1034 kPa at 23°C, 517 kPa at 60°C not to be used above 60°C.
  - .2 Bolt hole patterns to ANSI B16.1 class 125, threads to be tapered iron pipe size threads to ANSI B2.1.
- .3 Transition points: as recommended by manufacturer.
- .4 PEX fittings certified to CSA B137.5 and F1960.

## **2.5 JOINTS**

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy, lead free for copper pipe.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
  - .1 Gasket to be classified in accordance with ANSI/NSF 61 for potable water service.
  - .2 Couplings to be manufactured to copper-tube dimensions.
  - .3 Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.
- .6 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.
- .7 Solvent weld with primer to ASTM F493.
  - .1 Pressure rating 690 kPa at 82°C, 2760 kPa at 23°C.
- .8 NPS 1½ and smaller: PEX fittings to CSA B137.5.
- .9 NPS 2 and larger: PEX fittings to CSA B137.5 and ASTM F 1960. Elbows, adapters, couplings, plugs, tees, multi-port tees and valves.

## **2.6 GATE VALVES**

- .1 NPS 2 and under, soldered:

- .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified in Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, screwed:
  - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified in Section 23 05 23.01 - Valves - Bronze.

## **2.7 GLOBE VALVES**

- .1 NPS 2 and under, soldered:
  - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified in Section 23 05 23.01 - Valves - Bronze.
  - .2 Lockshield handles: as indicated.
- .2 NPS 2 and under, screwed:
  - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified in Section 23 05 23.01 - Valves - Bronze.
  - .2 Lockshield handles: as indicated.

## **2.8 SWING CHECK VALVES**

- .1 NPS 2 and under, soldered:
  - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified in Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, screwed:
  - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified in Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2 and under, push-to-connect, lift-disc type:
  - .1 To MSS-SP-80, 1380 kPa CWP, bronze body, stainless steel disc, spring, and shaft, suitable for installation in horizontal or vertical lines.

## **2.9 BALL VALVES**

- .1 NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 Bronze or Forged Brass body, chrome plated brass or stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronze body, chrome plated brass or stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2 and under, mechanical:

- .1 To CSA B137.5 and ASTM F 1960.
- .2 Lead free brass body.

## **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 NPC and local authority having jurisdiction.
- .2 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Buried tubing:
  - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
  - .2 Bend tubing without crimping or constriction. Minimize use of fittings.
- .6 Valves
  - .1 Isolate equipment, fixtures and branches with butterfly or ball valves.
  - .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

### **3.3 PRESSURE TESTS**

- .1 Conform to requirements of National Plumbing Code.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

### **3.4 FLUSHING AND CLEANING**

- .1 Flush entire system for 8 h. Ensure outlets flushed for two (2) hours. Let stand for 24 hours, and then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Federal potable water guidelines. Let system flush for additional two (2) hours, then draw off another sample for testing.

### **3.5 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.

### **3.6 DISINFECTION**

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Departmental Representative.
- .2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

### **3.7 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, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

### **3.8 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 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is 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 ten (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 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

### **3.9**

#### **CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**