

**Part 1 General**

**1.01 RELATED SECTIONS**

- .1 Entire Specification – All areas of common work.

**1.02 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .4 ANSI/ASME B16.24-2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
  - .1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .2 ASTM A536-84(2014), Standard Specification for Ductile Iron Castings.
  - .3 ASTM B88M-18, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
  - .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA B242-05(2016), Groove and Shoulder Type Mechanical Pipe Couplings.
  - .2 CSA B64.10-11/B64.10.1-11 (R2016), Selection and installation of backflow preventers / maintenance and field testing of backflow preventers.
  - .3 CSA B125.3-2018, Plumbing fittings.
  - .4 CSA B356-10(R2015), Water pressure reducing valves for domestic water supply systems
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67-2017, Butterfly Valves.
  - .2 MSS-SP-70-2006, Grey Iron Gate Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-71-2011, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
  - .4 MSS-SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.
- .7 National Research Council (NRC)
  - .1 National Plumbing Code of Canada 2010, with Provincial Amendments.
- .8 Association of Sanitary Engineers (ASSE)
  - .1 ASSE 1003-2009, Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems

**1.03 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.

**1.04 DELIVERY, STORAGE AND HANDLING**

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

**Part 2 Products**

**2.01 ACCEPTABLE MANUFACTURERS**

- .1 Refer to Section 21 05 01.

**2.02 PIPING AND FITTINGS**

- .1 Domestic hot, cold, tempered and recirculation systems, within building.
  - .1 Piping:
    - .1 Above ground: Type 'L' hard seamless copper tubing to ASTM B88M, third party certified.
    - .2 Buried or embedded: Type 'K' soft annealed copper tube to ASTM B88M, third party certified in long lengths and with no buried joints.
  - .2 Fittings:
    - .1 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
    - .2 Cast copper, solder type: to ANSI/ASME B16.18.
    - .3 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
  - .3 NPS 75mm and larger: roll grooved to CSA B242.
- .2 Domestic cold water service entry.
  - .1 Coordinate material and installation methods to match incoming Civil water service connection. Refer to Division 33 specification.

**2.03 JOINTS**

- .1 Solder: 95/5 or silver bearing lead-free.
- .2 Teflon tape: for threaded joints.
- .3 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.

- .4 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

#### **2.04 THERMOSTATIC MIXING VALVES**

- .1 CSA B125.3 listed thermostatic mixing valve with regulating piston made from engineered polymer.
- .2 Brass body with integral poppet style check valves on both inlets to prevent crossflow.
- .3 Supplied with shutoff device.

#### **2.05 BACKFLOW PREVENTERS**

- .1 Backflow preventer assembly complete with shut-off valves before and after check valves and test cocks. Assembly shall meet current AWWA requirements and CSA B64 standards.
- .2 Provide complete atmospheric vent backflow preventer assembly, consisting of two (2) positive sealing replaceable check valves with bronze seats, integral strainer and threaded vent connection.

#### **2.06 WATER HAMMER ARRESTERS**

- .1 Pre-charged hard drawn copper shock water hammer arresters complete, with brass piston, EPDM o-ring seals and threaded connection.
- .2 Designed to operate on domestic water system to maximum 1034 kPa working pressure at maximum temperature 82°C.

#### **2.07 AUTOMATIC AIR VENTS**

- .1 Provide at top of domestic water risers where shown, Maid-O-Mist #75 automatic air vents, 15mm inlet, 1035 kPa working pressure, brass construction.
- .2 Arrange air vents as required to prevent air locking of domestic hot water circulation system.
- .3 Provide 15mm shut-off valve on inlet supply.

#### **2.08 PRESSURE REDUCING VALVES**

- .1 The valve shall feature a bronze body suitable for water supply pressures up to 2758 kPa. Provision shall be made to permit the bypass flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply. Water Pressure Reducing Valve with built-in bypass check valves will be acceptable. Approved valve shall be listed to ASSE 1003 and IAPMO and certified to CSA B356. Valve shall be a Watts Series N45B-M1.

#### **2.09 UNIONS, FLANGES, AND COUPLINGS**

- .1 Rigid grooved mechanical couplings shall have an angle bolt pattern design and shall provide system support and hanging requirements in accordance with ASME B31.1. Rigid couplings shall be used in all locations unless otherwise noted. Standard of acceptance: Victaulic and Straub.

- .2 Flexible grooved mechanical couplings shall only be used around equipment to attenuate noise and vibration. Noise and vibration reduction at mechanical equipment is achieved by installing three (3) flexible couplings near the vibration source. Standard of acceptance: Victaulic and Straub.
- .3 For grooved mechanical couplings on potable water service, the gasket material shall be Grade "E" EPDM compound (green color coded stripe) conforming to ASTM D-2000 designation. Grade "E" gaskets are UL/ULC classified to ANSI/NSF 61 for -34°C to 110°C operating temperature range. Any deviations from the above in the way of special lubricants or special clauses in the manufacturers literature as to limitations on hot water must be brought to the attention of the Consultant and may not be accepted.
- .4 For domestic water, grooved mechanical coupling housings are cast with an angle pattern bolt pad for direct connection of copper tubing without flaring to IPS dimensions. Gaskets shall be molded of synthetic rubber in a FlushSeal configuration conforming to the copper tube size (CTS) outside diameter and coupling housing. Standard of acceptance: Victaulic and Straub.

### **Part 3 Execution**

#### **3.01 PREPARATION**

- .1 Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.
- .2 Use roll grooving tools to groove pipe in accordance with manufacturer's specifications. Use copper rolls for copper pipe as provided by the manufacturer.

#### **3.02 CONNECTION**

- .1 Use grooved mechanical couplings and mechanical fasteners as where allowed in accessible locations and mechanical rooms and where access can be obtained without removal of equipment or other materials such as ductwork etc. All grooved components shall be of one manufacturer and conform to local code approval. A gauged torque wrench must be used if required by the manufacturer.
- .2 Make connections to equipment, specialty components, and branch mains after isolation valves, with unions or flanges.
- .3 Provide dielectric type connections wherever jointing dissimilar metals in open systems. Brass adapters and valves are acceptable.
- .4 Use insulating plastic spacers for copper pipe installation in metal studs.

#### **3.03 ESCUTCHEONS**

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: One piece type with stainless steel set screws.
- .3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

### **3.04 ROUTES AND GRADES**

- .1 Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping wherever practical at common elevations. Install concealed pipes close to the building structure to keep furring to a minimum.
- .2 Slope water piping 0.2% and provide hose bibb drains at low points.
- .3 Provide air collection chambers with manual air vent at all high points of system. Collection chambers to be 25mm diameter or line size whichever is greater and 150mm high minimum. Square tees may only be used to assist with complete venting and draining.
- .4 Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting. Top flat for water.
- .5 Pipe the discharge from all relief valves, safety valves, vents, drains, equipment blowdowns, water columns, and overflows to the nearest building floor drain.

### **3.05 SERVICE CONNECTION**

- .1 Provide new domestic water service. Before commencing work check invert elevations required for connections, confirm inverts and ensure that these can be properly connected with sufficient slope and adequate cover to avoid freezing.

### **3.06 INSTALLATION**

- .1 Installation complies with National Plumbing Code of Canada and local authority having jurisdiction.
- .2 Install a water hammer arrester to each flush valve water supply or group of fixtures. Provide air chambers as same size as supply line or 20mm minimum.
- .3 Install expansion tanks as indicated on drawings.
- .4 Install thermostatic mixing valves as indicated on drawings.
- .5 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.
- .6 Provide proper insulation for all piping. Refer to Section 22 07 19 – Plumbing Piping Insulation.
- .7 Provide proper piping supports clearance and access to valves, air vents, drains and unions without removal of equipment or other materials such as ductwork etc. Refer to Section 22 05 29 – Hangers and Supports for Plumbing.
- .8 Provide proper labels and colors for piping to match existing.
- .9 Install piping material specified as inside the building to 2430mm outside of building and bury minimum 2430 mm deep.
- .10 Trap Primer: Install a BFP or in-line check valve to trap primer supply pipe.
- .11 Make systems completely operational, totally filled, thoroughly vented, and completely started.

### **3.07 PRESSURE TESTS**

- .1 Test pressure: greater of 1 times maximum system operating pressure 860 kPa. Maintain pressure without loss for 4 hours.

### **3.08 FLUSHING AND CLEANING**

- .1 Flush entire system before installation of equipment, fixtures, etc. in order to remove any foreign material in piping.

**3.09 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 (if any) are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

**3.10 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.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
  - .1 Establish circulation and ensure proper operation and to prevent water hammer.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Bring DHW and DHWR piping systems for freedom of movement, pipe expansion as designed.
  - .4 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

**3.11 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 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  - .3 Verify performance of temperature controls.
  - .4 Verify compliance with safety and health requirements.
  - .5 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
  - .6 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing and/or cleaning.

**3.12 OPERATION REQUIREMENTS**

- .1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 06 - Installation of Pipework.

**3.13 CLEANING**

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

**END OF SECTION**