

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 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 B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .2 ASTM A536 Standard Specification for Ductile Iron Castings.
  - .3 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American Water Works Association (AWWA).
  - .1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - .2 AWWA 6606 Grooved and Shouldered Joints.
- .4 Canadian Standards Association (CSA International).
  - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act, (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67, Butterfly Valves.
  - .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction.
  - .1 NRCC 38728, National Plumbing Code of Canada (NPC).
- .9 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act, (TDGA).
- .10 American National Standards Institute/National Sanitation Foundation (ANSI/NSF).
  - .1 ANSI/NSF 61 Drinking Water System Components.
  - .2 ANSF/NSF14 Plastic Piping System Components and Related Materials.

### **1.3 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for following: piping, fittings, valves and adhesives.
  - .1 Provide manufacturers printed product literature and data sheets including product characteristics, performance criteria, physical size, finish and pressure/temperature limitations.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets to Departmental Representative for each hazardous material prior to bringing hazardous materials to site.
- .4 Provide maintenance data for incorporation into manual specified in Section 01 78 00 -

Closeout Submittals.

#### **1.4 HEALTH AND SAFETY**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Separate for reuse and recycling and place in designated containers Steel waste in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with CEPA and local or municipal regulations.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

#### **1.6 QUALITY ASSURANCE**

- .1 Press Joint Copper Systems.
  - .1 Installer shall be a qualified, licensed within the jurisdiction, and factory trained with the installation of copper press joint systems. Certificate of factory training shall be submitted prior to starting work.
  - .2 Copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer.
  - .3 The installation of copper tubing for hot and cold water distribution systems shall conform to the requirements of the National Plumbing Code of Canada.

### **2 Products**

#### **2.1 PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground:
    - .1 Copper tube, hard drawn, type L: to ASTM B88M.

#### **2.2 FITTINGS**

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125: 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 1 1/2 (DN 40) and under: cast copper, ANSI/ASMS B16.12 of wrought copper, ANSI/ASME B16.22 with stainless steel internal components, EPDM seal and push to connect or press fit joints for hand drawn copper tube type L or type K rated for 1300 KPA at ASTM B88
- .6 Press fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed. Press ends shall have leakage path feature design. In 1/2" to 4" dimensions the leakage path feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

#### **2.3 JOINTS**

- .1 Rubber gaskets, latex free, 1.6 mm (1/16") 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.
- .4 Teflon tape: for threaded joints.
- .5 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.
- .6 Push to connect: EPDM gasket, UL classified in accordance with ANSI/NSF 61 for potable water service.

## **2.4 GATE VALVES**

- .1 NPS 2 (DN 50) and under, soldered:
  - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa (125 psi), bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze
- .2 NPS 2 (DN 50) and under, screwed:
  - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa (125 psi), bronze body, screw-in bonnet, solid wedge disc as Section 23 05 23.01 - Valves - Bronze

## **2.5 GLOBE VALVES**

- .1 NPS2 (DN 50) and under, soldered:
  - .1 To MSS-SP-80, Class 125, 860 kPa(125 psi), bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23.01 - Valves - Bronze
  - .2 Lockshield handles: as indicated.
- .2 NPS 2 (DN 50) and under, screwed:
  - .1 To MSS-SP-80, Class 150, 1 MPa (150 psi), bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23.01 - Valves - Bronze
  - .2 Lockshield handles: as indicated.

## **2.6 SWING CHECK VALVES**

- .1 NPS 2 (DN 50) and under, soldered:
  - .1 To MSS-SP-80, Class 125, 860 kPa (125 psi), bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 (DN 50) and under, screwed:
  - .1 To MSS-SP-80, Class 125, 860 kPa (125 psi), bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.

## **2.7 BALL VALVES**

- .1 NPS 2 (DN 50) and under, screwed:
  - .1 Class 150.
  - .2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 (DN 50) and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronze body, chrome plated brass 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 Execution**

### **3.1 INSTALLATION**

- .1 Install in accordance with NPC and local authority having jurisdiction.
- .2 Install pipe work in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Push-to Connect and Press Fit Piping: Prepare copper tube and install in strict accordance with manufacturer's instructions. Pipe ends to be cleaned, free from indentations, projections, burrs, and foreign matter. Use a tube preparation tool to clean and make installation mark, at the shoulder of the fitting. Push copper tube into fittings to installation depth mark, per manufacturer's instructions, to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer. Keep fittings free of dirt and oil.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Install pipe work in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework and by certified Journey Person supplemented as specified herein.

### **3.2 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 Test pressure: greater of 1-½ times maximum system operating pressure or 860 kPa (125 psi).

### **3.4 FLUSHING AND CLEANING**

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory bacteriological and chemical testing to verify that system is clean to provincial potable water guidelines. Let system flush for additional 2 h, 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 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 Timing:
  - .1 After pressure and leakage tests and disinfection 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 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, verifying that no residuals remain as a result of flushing and/or cleaning.
- .3 Reports:
  - .1 In accordance with Section 01 91 31 - Commissioning (cx) Plan: Reports, using report forms as specified.
  - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.
  - .3 Chemical and biological water testing report.
  - .4 Pressure testing report signed off by Contractor and witness for each section of piping tested.
  - .5 Flushing and cleaning report signed off by Contractor and witness for each section of piping.

**END OF SECTION**