

**SECTION 23 2113
HYDRONIC PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Valves:
 - 1. Ball valves.

1.02 RELATED REQUIREMENTS

- A. Section 23 0510 - General HVAC Requirements- Pipe sleeves.
- B. Section 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT.
- C. Section 23 0719 - HVAC PIPING INSULATION.
- D. Section 23 2114 - HYDRONIC SPECIALTIES.
- E. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.5 - Pipe Flanges and Flanged Fittings; 2013.
- B. ASME B31.9 - Building Services Piping; 2014.
- C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- E. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- F. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
- G. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).
- H. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.
- I. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.04 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- C. Provide non-conducting dielectric connections whenever jointing dissimilar metals.
- D. Fittings: Mitered Fittings and tapped pipes are not allowed. Weld elbows shall be long radius unless otherwise noted.
- E. Weldolets and Threadolets in Steel Piping: Weldolets and threadolets may be used for side outlet reducing tees if more than two pipe sizes smaller than main. Bonney Forge or Allied type 1 branchlet.
- F. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.
- G. Support piping independently from equipment.

- H. Gate valves shall not be utilized in building project.
- I. Provide valves for shut-off and to isolate equipment, or part of systems.
- J. Provide ball or butterfly valves for throttling or manual flow control service(balance valve).
- K. Provide check valves on discharge of all pumps.
- L. Drains: Provide 3/4 inch ball valves with gasketed cap with chain for drains at main shut off valves, low points of piping, bases of vertical risers, and at equipment.
- M. Air Vents: Provide manual or automatic air vents in accordance with Section 23 2114 at all high points in the piping and where shown.

1.05 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME (BPV IX).
- C. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Provide manufacturers catalogue information.
 - 3. Indicate valve data and ratings.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- E. Shop Drawings: Refer to Section 23 0510 for piping shop drawing requirements.
- F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum five years of experience.
- B. Welder Qualifications: Certify in accordance with ASME (BPV IX).

1.07 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Accept piping on site and inspect for cleanliness. Store in staging area in a protected location above grade.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage and store in a protected location.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HEATING WATER PIPING, ABOVE GRADE

- A. Floor distribution piping 2 inch and smaller and all Runouts to terminal equipment shall be copper tube.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using the following joints and fittings:
 - 1. Fittings: Solder type ASME B16.18 cast/bronze/brass or ASME B16.22 wrought copper fittings, unless otherwise noted.
 - 2. Joints:
 - a. Coil connections, and within equipment cabinets:

- 1) Soldered ASTM B32 lead and antimony free solder, 96 Sn/4 Ag (tin-silver) alloy with zinc fluoride flux.
- 2) Typical product is Harris Product Group 'Stay -Brite' with 'Staya-Clean' flux.
- b. Couplings, Tees and elbows in piping mains and branches:
 - 1) Brazed. AWS A5.8/A5.8M BuCP copper/silver/phosphorous alloy, minimum 1485 degree F liquidus.
 - 2) Solder shall be rated for recommended joint clearance of 0.002" to 0.006".
 - 3) Silver content shall be 5-15%, except 6% silver alloys are not acceptable.
 - 4) Typical products are Harris Product Group 'Stay-Silv 15', 'Stay Silv 5' and 'Dynaflo'.

2.02 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. Manufacturers: B-Line, Grinnell, Globe or Michigan. Figure numbers are for Michigan.
- C. Conform to ASME B31.9.
- D. Hangers Sizes 1/2 to 3/4 Inch: Carbon steel, adjustable swivel, loop. Figure 100.
- E. Hangers for Hot Pipe Sizes 1 to 4 Inches: Carbon steel, adjustable, clevis. Figure 400.
- F. Multiple or Trapeze Hangers(Over 2 inch pipe size): Steel channels with welded spacers and hanger rods.
- G. Wall Support for Single Pipe Sizes to 3 Inches: Carbon steel extension split ring pipe clamp, Figure 455.
- H. Wall Support for Vertical Multiple Pipes(1-1/2 inch and under: Green epoxy coated, cold formed, lipped steel channel horizontal member, 1-5/8" x 1-5/8" x 12 gauge base. Secure pipes to base with pipe/tubing clamps and elastomer cushion.
- I. Wall Support for Pipe Sizes 4 Inches and Over: Heavy duty, Welded carbon steel bracket and wrought steel clamp, Figure 353.
- J. Copper Pipe Support: As Specified above, copper plated where tube is not insulated.
- K. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- L. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.03 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches and Less:
 1. Ferrous Piping: 150 psig malleable iron, threaded.
 2. Copper Pipe: 400 psig WOG @ 275 degrees F, Brass O-Ring type with EPDM O-Ring , brass nut and tailpiece. Threaded or soldered with reduced size end connection as required by component connection. Apollo UA, FDI UP
 3. Test Plug tappings may be included on union tailpieces to provide the test plugs specified at piping components.
- B. Dielectric Connections: Dielectric nipple with galvanized or plated steel threaded ends. FDI-DN, Perfection, Pro Hydronic Specialties.

2.04 BALL VALVES

- A. Up To and Including 2 Inches:
 1. Two Piece Manufacturers: Apollo Model 70-100, Crane 9301, Flow Design HB/HC, Hammond 8201, Milwaukee BA200, Nibco T580, Stockham T255, Watts B6000.
 2. 400 psig WOG, Bronze two piece body, full port, chrome plated brass ball, reinforced teflon seats and stuffing box ring, blow-out proof stem design, adjustable packing gland,

zinc coated steel lever handle with vinyl hand grip with memory stops on balance valves, threaded ends .

2.05 FLOW INDICATOR-BALANCERS

- A. Manufacturers: B&G Circuit Setter, AAF #6000, Taco ACUF, Illinois #6000, Flow Set -F,HCi Terminator, Florater, Gerand, Armstrong "CBV", Wheatley "GS", Pro Hydronic Specialties "CBV".
- B. Balancer (1/2"- 2"): Calibrated bronze screwed balance valve with indicating pointer, memory stop, stainless steel ball, and with pressure taps for connecting differential pressure meter. Pressure taps shall be equipped with caps and integral check valves. Each valve shall have preformed, removable insulation cover. Locate to provide unrestricted flow up and down-stream in accordance with manufacturer's recommendations.
- C. Balancer (2-1/2" - 12"): Calibrated cast iron ball or globe style balance valve with flanged connections, indicating pointer, memory stop, and with pressure taps for connecting differential pressure meter. Pressure taps shall be equipped with caps and integral check valves. Each valve shall have preformed, removable insulation cover. Locate to provide unrestricted flow up and down-stream in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment using jointing system specified.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain plumb and level, unless noted otherwise.
- C. Maintain 4 inch clearance between pipe and fittings after insulation.
- D. Install piping to conserve building space and to avoid interfere with use of space.
- E. Group piping at common elevations.
- F. Sleeve pipe passing through new masonry partitions, walls and floors. Provide sleeves at rated partitions as required by firestopping assembly.
- G. Maintain top of piping level with eccentric reducers. Arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 24 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Use double nuts and lock washers on threaded rod supports.

8. Prime coat concealed steel hangers and supports not provided with a corrosion resistant finish. Refer to Section 09 9000.
9. Support piping from floor only where shown on drawings or where piping is routed along floor.
- J. Prepare exposed unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- K. Install valves and pipe appurtenances in a readily accessible location.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Unions: Provide unions at locations specified and at all locations to permit removal of equipment and ATC control valves for service. Install in correct direction with brass nut upstream. Do not install unions to expedite pipe assembly. Use flanges or grooved coupling for unions for pipes sizes over 2 inch.
- N. Dissimilar Metals (Dielectric): Provide dielectric nipples to provide separation between ferrous and nonferrous piping/fittings. Install on ferrous side of connection. Do not install dielectric unions. Dielectric connection shall be comprised of dielectric nipple or thread-to sweat brass adapter or brass valve. Install unions specified with dielectric nipple where separation is required at a union.
- O. Steel Pipe Nipples: All thread (close) nipples are prohibited. Nipples 1-1/2 inch and smaller and attached to larger pipes shall be schedule 80 and attached by the use of threadolets.

3.03 SCHEDULES

- A. Hanger spacing indicated is maximum span based on pipe material and size. Conform to structural spacing and load capacity of structural support points and provide closer spacing as required.
- B. Hanger Spacing for Copper Tubing.
 1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION