

**SECTION 23 2213
STEAM AND CONDENSATE HEATING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Pipe hangers and supports.
- C. Steam piping system.
- D. Steam condensate piping system.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 08 3100 - Access Doors and Panels.
- C. Section 09 9123 - Interior Painting.
- D. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- E. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- F. Section 22 0719 - Plumbing Piping Insulation.
- G. Section 23 0523 - General-Duty Valves for HVAC Piping.
- H. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- I. Section 23 0553 - Identification for HVAC Piping and Equipment.
- J. Section 23 0719 - HVAC Piping Insulation.
- K. Section 23 2214 - Steam and Condensate Heating Specialties.
- L. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2011.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2012.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2013.
- D. ASME B31.1 - Power Piping 2020.
- E. ASME B31.9 - Building Services Piping 2014.
- F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications 2015.
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2012.
- H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2015.
- I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2015.
- J. ASTM B32 - Standard Specification for Solder Metal 2020.
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2014.
- L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2013.
- M. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992, with Editorial Revision (2018).
- N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015.

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- P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2009.

1.04 SYSTEM DESCRIPTION

- A. When more than one piping system material is selected, ensure systems components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- B. Use unions and flanges downstream of valves and at equipment or apparatus connections. Use dielectric unions where joining dissimilar materials. Do not use direct welded or threaded connections.
- C. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- D. Use gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use globe valves for throttling, bypass, or manual flow control services.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Valve Repacking Kits: One for each type and size of valve.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section, with minimum 3 years of documented experience.
- C. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labelling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. 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 REGULATORY REQUIREMENTS

- A. Comply with ASME B31.9 and ASME B31.1 code for installation of piping system.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

2.02 MEDIUM AND HIGH PRESSURE STEAM PIPING (150 PSIG MAXIMUM)

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel welding type.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.
- B. Steel Pipe Sizes 16 Inch and Over: ASTM A53/A53M, 3/8 inch wall, black.
 - 1. Fittings: ASTM A234/A234M wrought steel welding type.
 - 2. Joints: Welded in accordance with AWS D1.1/D1.1M.

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2.03 LOW PRESSURE STEAM PIPING (15 PSIG MAXIMUM)

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.
- B. Steel Pipe Sizes 12 Inch and Over: ASTM A53/A53M, 3/8 inch wall, black.
 - 1. Fittings: ASTM A234/A234M wrought steel.
 - 2. Joints: Welded in accordance with AWS D1.1/D1.1M.

2.04 MEDIUM AND HIGH PRESSURE STEAM CONDENSATE PIPING

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150 or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.
- B. Steel Pipe Sizes 12 Inch and Over: ASTM A53/A53M, 3/8 inch wall, black.
 - 1. Fittings: ASTM A234/A234M wrought steel.
 - 2. Joints: Welded in accordance with AWS D1.1/D1.1M.

2.05 LOW PRESSURE STEAM CONDENSATE PIPING

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.
- B. Steel Pipe Sizes 12 Inch and Over: ASTM A53/A53M, 3/8 inch wall, black.
 - 1. Fittings: ASTM A234/A234M wrought steel.
 - 2. Joints: Welded in accordance with AWS D1.1/D1.1M.

2.06 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. Hangers for Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- C. Hangers for Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- D. Multiple or Trapeze Hangers for Pipe Sizes to 4 inches: Steel channels with welded spacers and hanger rods.
- E. Multiple or Trapeze Hangers for Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods; cast iron roll and stand.
- F. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- G. Wall Support for Pipe Sizes 4 to 5 Inches: Welded steel bracket and wrought steel clamp.
- H. Wall Support for Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll.
- I. Vertical Support: Steel riser clamp.
- J. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- K. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- L. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- M. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- N. Inserts: Malleable iron case or 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.

2.07 UNIONS, FLANGES, COUPLINGS AND GASKETS

- A. Unions for Pipe 1-1/4 Inches and Under:

1. Ferrous Piping: 150 psig galvanized malleable iron, threaded.
 2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe Over 1-1/4 Inches
1. Ferrous Piping: 150 psig forged steel, slip-on.
 2. Copper Piping: Bronze.
- C. Dielectric Connections: Shall be made with the use of brass fittings (union, valve, flange or coupling) or other non-conductive connections (final approval by owner) whenever joining dissimilar metals. A valve shall be placed upstream of any connection involving a union or flange. Dielectric unions shall not be used and shall be replaced with any of the before mentioned connections if encountered during repair or retrofit work..
- D. Gaskets: 1/8 inch thick preformed stainless steel core with non-asbestos compressible graphite sealing element:
1. Manufacturer: Garlock; Graphonic 304 Stainless: www.garlock.com
 2. Substitutions: See Section 01 1600 - Product Requirements.

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 with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 2500.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Sleeve pipe passing through partitions, walls, and floors.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Inserts:
 1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- G. Pipe Hangers and Supports:
 1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as indicated.
 3. Place hangers within 12 inches of each horizontal elbow.
 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 7. Provide copper plated hangers and supports for copper piping.

8. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100.
- J. Slope steam piping one inch in 40 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe level.
- K. Slope steam condensate piping one inch in 40 feet. Provide drip trap assembly at low points and before control valves. Run condensate lines from trap to nearest condensate receiver. Provide loop vents over trapped sections.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- M. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 9123.
- N. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

- A. 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.
 4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 5. 3 inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 6. 4 inch: Maximum span, 12 feet; minimum rod size, 1/2 inch.
- B. Hanger Spacing for Steel Steam Piping.
 1. 1/2 inch: Maximum span, 8 feet; minimum rod size, 1/4 inch.
 2. 3/4 inch and 1 inch: Maximum span, 9 feet; minimum rod size, 1/4 inch.
 3. 1-1/4 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 4. 1-1/2 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 5. 2 inches: Maximum span, 13 feet; minimum rod size, 3/8 inch.
 6. 2-1/2 inches: Maximum span, 14 feet; minimum rod size, 3/8 inch.
 7. 3 inches: Maximum span, 15 feet; minimum rod size, 3/8 inch.
 8. 4 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.
 9. 6 inches: Maximum span, 21 feet; minimum rod size, 1/2 inch.
 10. 8 inches: Maximum span, 24 feet; minimum rod size, 5/8 inch.
 11. 10 inches: Maximum span, 26 feet; minimum rod size, 3/4 inch.
 12. 12 inches: Maximum span, 30 feet; minimum rod size, 7/8 inch.
 13. 14 inches: Maximum span, 32 feet; minimum rod size, 1 inch.
- C. Hanger Spacing for Steel Steam Condensate Piping.
 1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
 8. 8 inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.
 9. 10 inches: Maximum span, 20 feet; minimum rod size, 3/4 inch.
 10. 12 inches: Maximum span, 23 feet; minimum rod size, 7/8 inch.

END OF SECTION

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