

SECTION 23 24 16 - INTERNAL-COMBUSTION ENGINE EXHAUST PIPING

PART 1 - GENERAL

1.01 BUY AMERICAN REQUIREMENTS

A. Provide certificates to show that all products meet the following requirements.

1. American Iron and Steel (AIS)
2. Build America, Buy America Act B.

1.02 SUMMARY

A. Section Includes:

1. Engine exhaust.
2. Equipment drains and overflows.
3. Unions and flanges.
4. Pipe hangers and supports.

B. Related Sections:

1. Section 23 05 53 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
2. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.

1.03 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B16.3 - Malleable Iron Threaded Fittings.
2. ASME B16.4 - Gray Iron Threaded Fittings.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME B31.1 - Power Piping.
6. ASME B31.9 - Building Services Piping.
7. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and HotDipped, Zinc-Coated, Welded and Seamless.
2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
3. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron PressureRetaining Castings for Use at Elevated Temperatures.

4. ASTM A536 - Standard Specification for Ductile Iron Castings.
5. ASTM B32 - Standard Specification for Solder Metal.
6. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
7. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
8. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

2. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
3. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
4. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
6. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
7. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.04 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.
- D. Use gate or ball valves for shut-off and to isolate equipment.
- E. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to floor.
- F. Flexible Connectors: Use at or near engine driven equipment where piping configuration does not absorb vibration.

1.05 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Shop Drawings: Indicate schematic layout of piping system, including equipment, critical dimensions, and sizes.
- C. Product Data:
1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
- D. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Test Reports: Indicate results of piping system pressure test.
- F. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- H. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

1.06 CLOSEOUT SUBMITTALS

- A. Section 01 77 00 - Closeout Procedures: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves, equipment and accessories.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.1 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- C. Maintain one copy of each document on site.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

- B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- C. Design piping system under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Alaska.

1.09 PRE-INSTALLATION MEETINGS

- A. Section 01 31 00 – Project Management and Coordination: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 40 00 - Quality Requirements: Product storage and handling requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- 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.

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.01 ENGINE EXHAUST PIPE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, 0.375 inch wall for sizes 12 inch and larger, black.
 - 1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.
 - 3. Insulation: Provide in accordance with section 230700.

2.02 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
 - 1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
 - 2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, cut grooved ends.

1. Fittings: ASTM A395/A395M and ASTM A536 ductile iron, or ASTM A234/A234M carbon steel, grooved ends.
2. Joints: Grooved mechanical couplings meeting ASTM F1476.
 - a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, hot dipped galvanized, compatible with steel piping sizes, rigid or flexible type.
 - b. Gasket: Elastomer composition for operating temperature range from 86 degrees F to 230 degrees F.
 - c. Accessories: Stainless steel bolts, nuts, and washers.

C. Copper Tubing: ASTM B88, Type K, drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin silver, lead free solder.

2.03 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.
2. Copper Piping: Class 150, bronze unions with soldered.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. Copper Piping: Class 150, slip-on bronze flanges.
3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.04 BALL VALVES

A. Manufacturers:

1. Hammond Valve Model 8201 or approved equal.
2. Substitutions: 01 40 00 - Quality Requirements.

B. 2 inches and Smaller: MSS SP 110, 400 psi WOG, two piece bronze body, chrome plated brass ball, regular port, teflon seats, blow-out proof stem, press ends, lever handle.

2.05 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Grinnell or approved equal.

2. Substitutions: 01 40 00 - Quality Requirements.

- B. Conform to ASME B31.1, ASME 31.9, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.
- C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- D. Hangers for Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
- E. Hangers for Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
- F. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll. G. Vertical Support: Steel riser clamp.
- H. Floor Support for Pipe 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- I. Floor Support for Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- J. Copper Pipe Support: Carbon steel rings, adjustable, copper plated.
- 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.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- 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. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1, ASTM F708, and MSS SP 89.
- B. Support horizontal piping as scheduled.

- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
- G. Provide sheet lead packing between hanger or support and piping.
- H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- I. Install pipe hangers and supports in accordance with Section 22 05 29.

3.03 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install engine exhaust piping in accordance with ASME B31.1.

3.04 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test engine exhaust piping in accordance with ASME B31.1.
- C. Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8

2-1/2 (Note 1)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4

D. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION

ADDENDUM 1

DRAWINGS