

Section 15140

PIPE HANGERS, SUPPORTS, AND RESTRAINTS

PART 1 GENERAL

1.01 SUMMARY

This Section includes the furnishing and subsequent installation of:

- A. Pipe and equipment hangers, supports, and associated anchors
- B. Equipment bases and supports
- C. Sleeves and seals

1.02 MEASUREMENT AND PAYMENT

No separate payment for Work performed under this Section. Include cost of same in Contract price bid for Work of which this is a component part.

1.03 REFERENCES

This specification references the following publications in their current editions. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- A. ASME B31.1: Power Piping, Sections 120 and 121 of ASME B31.1
- B. ASME B31.3: Process Piping
- C. ASTM A36/A36M: Standard Specification for Carbon Structural Steel
- D. ASTM A510/A510M: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel and Alloy Steel
- E. ASTM A575: Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
- F. ASTM A576: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
- G. AWS D1.1/D1.1M: Structural Welding Code - Steel
- H. MSS SP-58: Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application and Installation

1.04 SUBMITTALS

Submit the following in accordance with Section 01330 – “Submittal Procedures:”

- A. Submit Shop Drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- B. Mark dimensions and values in units to match those specified.
- C. As a minimum, submit the following items:
 - 1. A layout of the systems including location on fixed and movable joints.
 - 2. Itemized list of wall sleeves, anchors, support devices and all other items related to pipe support system.
 - 3. Details of design and fabrication of joints.
 - 4. Details of support brackets, cradles, pads, thrust resisting elements, and other supporting elements.
 - 5. Other pertinent elements necessary for a complete installation.
 - 6. Manufacturer's installation instructions.
 - 7. Design calculations for submitted items.
 - 8. Acknowledgement that products submitted meet requirements of standards referenced.

1.05 RELATED REQUIREMENTS

The following related requirements are as applicable and as indicated as part of these Contract Specifications:

- A. Section 01330 – "Submittal Procedures"
- B. Section 09902 - "Painting and Protective Coating"

1.06 – 1.13 (NOT USED)

PART 2 PRODUCT

2.01 MANUFACTURER(S) (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

- A. Hangers and Supports

1. For uninsulated lines 2 inches and less and for drainage and downspout lines provide hangers which are adjustable swivel ring type fabricated of malleable iron.
2. For uninsulated lines larger than 2 inches and for insulated lines, except drainage and downspout piping, provide adjustable clevis type hangers. Size hangers to allow insulation to extend unbroken through the hanger.
3. Fabricate hangers installed in valve vaults, wet wells, and other below grade areas of cadmium plated or stainless steel.

B. Hanger Rods:

1. Materials used shall conform to ASTM A36/A36M, ASTM A510/A510M, Grade 1020, ASTM A575, Grade M1020, and ASTM A576, Grade 1020 with a minimum allowable tensile stress of 12,000 psi at 650°F per MSS SP-58.
2. Rods shall be continuously threaded and hot-dipped galvanized after threads are cut.
3. Load limit:

Nominal Rod Diameter (inches)	Maximum Safe Load, (lbs.)
3/8	610
1/2	1,130
5/8	1,810
3/4	2,710
7/8	3,770
1	4,960

C. Hangers for suspended piping shall be constructed of steel and hot-dipped galvanized.

D. Inserts

Make inserts for individual hangers of galvanized malleable iron; include removable nuts held in place by V-type teeth on the insert body and nut. Make continuous-slotted channel inserts of galvanized steel with integral anchors at 6-inch centers. Provide factory finished steel snap-on cover plates on channel inserts between support attachments.

E. Expansion Bolts

Use expansion bolts for supports which are stainless steel wedge type. Do not use expansion bolt anchors with lead.

F. Pipe Saddles

1. For pipes located three (3) feet or less from floor, except as otherwise indicated on Plans.
2. Fabricate pipe saddles of hot dip galvanized steel. Saddles for supporting pipe from the floor shall be at least 9 inches in length and as wide as the outside diameter of the pipe. Make a bearing support of 120 degrees. Mount saddles on concrete pads at least 2 inches high.

G. Pipe Support Base Plate:

1. Base Plates shall be 4 inches larger than pipe support.
2. Collar shall be 3/16 inches thick, circular in shape, and sleeve type connection to pipe.
3. Collar fitted over outside of support pipe and extended 2 inches from floor plate.
4. Collar is to be welded to floor plate with edges ground smooth.
5. The assembly shall be hot dipped galvanized after fabrication.

H. Framing Hangers

1. Use factory fabricated metal framing systems with factory applied primer paint as framing for wall type hangers, trapeze hangers, and tunnel stanchions.
2. Attach supports to structures with inserts for new concrete, with surface mounting methods for masonry or existing concrete, and with welding or clamps for structural steel.
3. Make pipe supports fabricated on the site of structural steel members with raw edges ground and dressed.
4. Rest floor supports in areas with uncovered concrete floors on concrete pads not less than 2 inches high.

2.03 DESIGN REQUIREMENTS

- A. Design supports capable of supporting the pipe for all service and testing conditions with a five (5) to one (1) safety factor.
- B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.
- C. Design supports and hangers to allow for proper pitch of pipes.

D. Chemical and waste piping:

For design, materials of construction and installation of pipe hangers, supports, guides, restraints, and anchors follow guidelines called for in ASME B31.3 and MSS SP-58.

E. Steam and hot and cold water piping:

For design, materials of construction and installation of pipe hangers, supports, guides, restraints, and anchors follow guidelines called for in ASME B31.1 and MSS SP-58.

F. Check all physical clearances between piping, support system and structures. Provide for vertical adjustment after erection.

G. Support vertical pipe runs in pipe chases at base of riser by supporting pipes for lateral movement with clamps or brackets.

H. Place hangers on outside of all pipe insulation per the following:

1. Use a pipe covering protection saddle for insulated pipe at each support point.
2. For insulated piping 1-1/2" and less provide a 9" length of 9 pound density fiberglass insulation at saddle.
3. For insulated piping over 1-1/2" provide a 12" length of 9 pound density fiberglass insulation at saddle.

I. Provide 20 Gauge galvanized steel pipe saddles for fiberglass and plastic support points to ensure a minimum contact width of 4".

J. Pipe Support Spacing:

1. Factor loads by specific weight of liquid conveyed if specific weight is greater than water.
2. Locate pipe supports at maximum spacing scheduled unless indicated otherwise on the Plans.
3. Provide at least one (1) support for each length of pipe at each change of direction and at each valve.

2.04 (NOT USED)

PART 3 EXECUTION

3.01 – 3.02 (NOT USED)

3.03 ERECTION, INSTALLATION AND CONSTRUCTION

A. Installation

1. Hang piping inside structures supported from the floor or racked adjacent to walls.
2. Provide inserts cast in concrete walls or slabs for hanging and supporting pipe. If materials not hot-dipped galvanized, paint them with primer before installation.
3. Design fabricate, and install support components in general conformance with Sections 120 and 121 of ASME B31.1, except as modified in this Section.

B. Pipe Hangers and Supports

1. Support, brace, and anchor interior piping to prevent movement in any direction because of pressure, temperature, flow, or water hammer, except at properly located expansion joints and fittings.
2. Locate piping and pipe supports as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.
3. Inspect hangers for:
 - a. Design offset
 - b. Adequacy of clearance for piping and supports in the hot and cold positions
 - c. Guides to permit movement without binding
 - d. Adequacy of anchors
4. Inspect hangers after erection of piping systems and prior to pipe testing and flushing.
5. Provide two pipe guides on each side of expansion joints at which pipe movement occurs. The first guide shall be not more than 4-pipe diameters from the joint and the second not more than 14 diameters. Provide additional guides as required to maintain pipe alignment, spaced as required for the pipe size, fluid pressure and temperature inside the pipe, and as recommended by the expansion joint manufacturer or as shown.

6. Maximum support spacing and hanger rod sizes for metal pipe containing liquids are as follows:

Nominal Pipe Size (Inches)	Support Spacing (Feet)	Rod Diameter in Inches	
		One Rod	Two Rods
1 and Smaller	7	3/8	3/8
1¼ and 1½	8	3/8	3/8
2	10	3/8	3/8
2½	11	1/2	3/8
3	12	1/2	3/8
4 and 5	14	1/2	3/8
6 and 8	17	1/2	3/8
10	17	5/8	1/2
12	17	3/4	1/2
14	17	3/4	5/8
16	17	7/8	5/8
18 and 20	17	1	3/4
24	17	1-1/8	7/8

7. For valves 4 inches and larger in unburied horizontal lines support the valve on both sides when located within 18 inches of the valve or meter. Provide additional supports where required so that piping loads do not place damaging stresses on supports, valves, and equipment. Where necessary, block up pipe at supports to permit installation of insulation.
8. Support unburied horizontal runs of rubber hose and non-metallic pipe for the entire length by means of troughs consisting of structural steel channels or angles supported at not more than 10-foot intervals.
9. Support piping not included in the foregoing tabulation as indicated or in accordance with the pipe manufacturer's recommendations, if not indicated.
10. Anchor buried pressure pipe at each fitting causing a change in direction of 10 degrees or more. Concrete thrust blocks or other restraining devices in any satisfactory combination may be used. Submit the details of the method proposed for use, together with design calculations, to the Engineer before installation.

C. Welding and Weld Supports:

1. Welding shall follow requirements of AWS D1.1/D1.1M.

2. Weld anchors to pipe in accordance with ASME B31.3.
 3. Welding rods: ASTM and AWS standards.
 4. Integral attachments:
 - a. Include welded-on ears, shoes, plates and angle clips.
 - b. Ensure material for integral attachments is of good weldable quality.
 5. Preheating, welding and post heat treating: ASME B31.3, Chapter V.
- D. Field Painting:
1. Comply with Section 09902 - "Painting and Protective Coating."

3.04 – 3.10 (NOT USED)

END OF SECTION