

## SECTION 15060 – HANGERS AND SUPPORTS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 WORK INCLUDED

- A. Furnish and install all hangers, supports and assemblies for all parts of the mechanical systems. This shall include all piping, ducts and equipment specified in this Division and as shown on the drawings
- B. All materials shall be new and manufactured for the specific purpose of supporting systems, equipment, pipes, ducts, conduits and accessories.
- C. All system components shall be installed in accordance with local codes including seismic isolation as required and specified under Section 15241.
- D. Refer to section 15121 Pipe expansion and closely coordinate with this work.
- E. Secure all permits and local/state approval for the components as specified and included under this Section.

#### 1.3 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.
- B. Refer to Section 15241 – Mechanical Vibration Controls and Seismic Restraints for specified information related to and affecting this section.
- C. Refer to Section 15121 – PIPE EXPANSION.

#### 1.4 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.
1. Material standards shall be as specified or detailed hereinafter and as following:
  2. ASME B31.9 – Building Services Piping, The American Society of Mechanical Engineers.
  3. ASME B31.1 – power piping.
  4. ASHRAE Systems and Equipment Handbook.
  5. ASTM F 708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
  6. MSS SP-58 – Pipe Hangers and Supports – Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry.
  7. MSS SP-69 – Pipe Hangers and Supports – Selection and Application; Manufacturers Standardization Society of the Valve Fittings Industry.
  8. MSS SP-89 – Pipe Hangers and Supports – Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry.
  9. NFPA-13 – Installation of Sprinkler Systems
  10. MSS-SP-127-2001 – Bracing for Piping Systems.

#### 1.5 SYSTEM DESCRIPTION

- A. In addition to special hangers and supports specified elsewhere in this Section and shown on the drawings for ducts, piping and equipment, furnish and install safe and substantial means of support for all parts of the mechanical systems. Shop drawings shall be submitted for review and approval for all supports. All piping, ductwork, exhaust pipe and breeching hangers and supports in all mechanical rooms, penthouses and energy plant shall be installed with vibration isolators and Seismic restraints. This requirement is mandatory and shall be strictly enforced.
- B. All piping shall be hung to true alignment, using appropriate and substantial hanger arrangements. Wire and strap hangers will not be permitted. Hangers shall be located so that piping and hangers will be clear of other piping, hangers, conduits, lighting and other obstructions.
- C. The hanging and supporting of piping and equipment shall conform to recommendations of the manufacturers of same and American National Standard, ANSI/MSS SP-58 and SP-69 latest edition, except where requirements of this specification exceed the above referenced Standards.

#### 1.6 SUBMITTALS

- A. See Section 15050 and General Conditions for Additional Requirements.
- B. All brackets and hangers shall be submitted for review. Include the method of hanging and supporting all piping, ductwork and equipment.

- C. The architect is to be notified when the first bracket is assembled so that the installation can be reviewed in the field.
- D. Provide location of all inserts to be used for hanging ductwork, piping and equipment and the weight of all components (including water weight).

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products of the type specified in Part 2 – Products.
- B. Installer: Company specializing in performing work of the type specified in this section, with documented experience.
- C. Welders: Certify in accordance with ASME.

#### 1.8 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of piping system and supports.
- B. Conform to ASME B31.1 code for power piping.
- C. All applicable seismic codes.
- D. ASTM F708 for design and installation of pipe hangers..
- E. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations
  - 1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. All hangers and supports shall be delivered in containers and shall be kept in a dry and protected area.
- B. All exposed hangers, supports, etc. shall be given 2 coats of rust resistant paint of a color selected by the Architect prior to installation.

#### 1.10 ENVIRONMENTAL

- A. Do not paint or install inserts, hangers and/or supports when environmental conditions are outside the specific limitations of the referenced codes and manufacturer's recommendations.

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. Pipe supports shall be of type and figure number as specified.
- B. Acceptable manufacturers subject to compliance with the specifications shall be as follows:
  - 1. Pipe Hangers
    - a. Carpenter & Patterson
    - b. B-Line
    - c. Grinnell
    - d. National Pipe Hanger Corp.
    - e. Piping Technology & Products Inc.
    - f. PHD Manufacturing, Inc.
  - 2. Channel Support Systems
    - a. B-Line Systems, Inc.
    - b. Grinnell Corp. Power-Strut Unit
    - c. GS Metals Corp.
    - d. Michigan Hanger Co., Inc. O-Strut Div.
    - e. National Pipe Hanger Corp.
    - f. Thomas & Betts Corp.
    - g. Unistrut Corp.
    - h. Wesanco, Inc.
  - 3. Thermal-Hanger Shield Inserts
    - a. Carpenter & Patterson, Inc.
    - b. Michigan Hanger Co., Inc.
    - c. PHS Industries, Inc.
    - d. Pipe Shields, Inc.
    - e. Rilco Manufacturing Co., Inc.
    - f. Value Engineered Products, Inc.

### 2.2 PIPE HANGERS

- A. Bracket assemblies for supporting piping are to be fabricated by welding and all irregular surfaces are to be smoothed up by grinding. Shop drawings shall be submitted for review for each type bracket. The Architect is to be notified when the first bracket is assembled so that installation can be reviewed in the field.

Exposed hangers, supports and brackets are to be given (2) coats of rust resistant paint of the color as selected by the Architect. Additionally, provide for Architect's review, the following:

1. Location of all inserts to be used for hanging ductwork and piping where applicable and the weight of such pipe or equipment to be hung, including the weight of water, valves and insulation.
  2. Method of hanging and support of all piping, ducts and other equipment.
- B. All pipe supports shall be of type and arrangement as hereinafter specified. They shall be so arranged as to prevent excessive bending stresses between supports.
- C. All bracket clamp and rod sizes indicated in this specification are minimum sizes only. This Section shall be responsible for structural integrity of all supports. All structural hanging materials shall have a safety factor of (5) built in. Beam clamps shall be 2-sided steel clamps designed to firmly attach to the flange of the beam with the load directed downward on the centerline of the beam web. Beam clamps shall be similar to B-Line #B3055, or approved equal.
- D. Other forms of hangers and supports shall be used to accommodate special or unusual job conditions or conditions not covered herein, subject to the approval of the Architect. When special conditions require the use of concrete inserts which are not "built in", such inserts may be used in locations approved by the Architect and shall be Phillips "Red Head" or approved equal. Explosive powder studs or detonator assisted studs or anchors will not be permitted.
- E. All pipes shall be hung free of dependence on pipe sleeves for support.
- F. All auxiliary steel required for pipe, duct and equipment supports shall be furnished and installed by the Mechanical Contractor.
- G. Threaded pipe, chains, wire and perforated straps will not be accepted. No piping shall be supported from ductwork, conduit or other piping. All system components and equipment shall be independently supported. Distribute hangers on parallel piping to avoid overloading of structure.
- H. Roller type supports shall be used for pipes subject to axial movement (all hot water steam, condensate and any emergency generator exhaust). They shall be braced so that movement occurs in roller rather than support rods. This requirement shall apply to piping 2 1/2" and up.
- I. Hangers and supports used for systems exposed to weather shall be hot dipped galvanized in accordance with ASTM A153-73 or A123. Rods and nuts shall be electro-galvanized.
- J. All horizontal water, drain, waste, vent and rainwater piping shall be hung with clevis steel hangers similar to B-Line #B3100. Groups of pipes in the same horizontal plane and with the same pitch may be supported on B-Line #3160 gang hangers. Wall brackets similar to shall be B-Line #B3066 and #B3077.

- K. All pipes which are hung so that the centerline of the pipe is less than 10" below the point of suspension of the hanger rod and all hydronic hot water piping shall be supported on roller hangers similar to B-Line #B3110.
- L. Unless otherwise noted, maximum hydronic pipe hanger spacing shall not exceed the recommendations of the pipe manufacturer and the following:
1. For 1/2" copper and steel pipe: 5'-0" o.c.
  2. For pipe 3/4" to 1 1/2": 8'-0" o.c.
  3. For pipe 2" to 8": 10'-0" o.c.
  4. For pipes 10" and up: 15'-0" o.c.
  5. In addition, hangers shall be installed within 2'-0" of each change in direction and on each side of valves 3" in size and up.
- M. Hanger rods shall be of steel and not less in diameter than:
1. For pipe 2" and under: 3/8"
  2. For pipe 2 1/2" and 3": 1/2"
  3. For pipe 4" and 5": 5/8"
  4. For pipe 6": 3/4"
  5. For pipe 8", 10" and 12": 7/8"
  6. For pipe 14" and 16": 1"
  7. For pipe 18" and up: 1 1/4"
- N. Insulated steel piping 2 1/2" and up, except chilled water, shall be fitted with steel pipe covering protection saddles similar to B-Line #B3163 and of the same depth as the specified insulation. Saddles shall be tack welded to the pipe and filled with loose insulation. Standard length saddles may be cut in (2) equal sections for attachment to pipes 6" diameter and under.
- O. Insulated piping 2" and under, except chilled water, shall be fitted with 16 gauge steel covering protectors at each hanger location similar to B-Line #B3151.
- P. Chilled water piping shall be insulated with high density hydrous calcium silicate shields where hangers occur similar to #B3380CW. Special care shall be exercised to assure a continuous vapor barrier installation to protect the system and prevent sweating.
- Q. All vertical piping shall be supported with steel riser clamps similar to B-Line #B3773. Such clamps on copper tubing shall be applied over couplings only.
- R. All pipes suspended at an elbow shall be hung using plate lugs similar to Grinnell #HS.53 with forged steel clevis similar to B-Line #B3201.
- S. Spring hanger locations shall be provided as specified herein, under vibration isolation, and shall be Grinnell, pre-engineered to meet loads and movements in accordance with ANSI B.31.1.10, where applicable.
- T. Drop rods for hangers may be used wherever possible and shall be installed prior to slabs being poured. Drop rod details shall be submitted to the Architect and Engineer for review.

## 2.3 DUCT HANGERS

- A. See Specification 15815 Sheet Metal.

## 2.4 MISCELLANEOUS MATERIALS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Structural Steel: ASTM A 36M, steel plates, shapes, and bars, black and galvanized.
- C. Grout: ASTM C 1107, Grade B, factory-mixed and packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
  - 1. Characteristics: Post hardening and volume adjusting recommended for both interior and exterior applications.
  - 2. Properties: Nonstaining, noncorrosive and nongaseous
  - 3. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. All hangers, rod and supports shall receive two (2) coats of rust inhibitive paint.
- B. Provide inserts for placement in concrete formwork.
- C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- E. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

### 3.2 INSTALLATION

- A. Pipe Hangers and Supports.
  - 1. Install in accordance with ASME B31.9, ASTM F 708, or MSS SP-89 or NFPA-13.
  - 2. Support piping, ductwork and equipment as specified under Part 2.
  - 3. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

4. Place hangers with 24 inches of each horizontal elbow and on each side of valves 3” in size and up.
  5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
  7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  8. Provide copper plated hangers and supports for copper piping or between hanger support and piping.
  9. Prime coat (2 coats rust inhibitive paint) exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  10. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- B. Where pipe support members are welded to structural building framing, scrape, brush clean and apply two coats of zinc rich primer to welds.

### 3.3 INSERTS

- A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- B. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inch or ducts over 60 inches wide.
- C. Finish inserts, flush with slab surface.
- D. Inserts: Steel, slotted type, factory-painted.
  1. Single rod: Similar to Grinnell Figure 281.
  2. Multi-rod: Similar to Carpenter and Paterson 1480 Type 1.
  3. Clip form nails flush with inserts.
  4. Maximum load 75 percent of rating.

### 3.4 SUPPORTS FROM BUILDING CONSTRUCTION

- A. Inserts, Beam Clamps, Steel Fishplates (in concrete fill only), Cantilever Brackets or Other Means.
- B. Submit for Review.
- C. Grouped Lines and Services
  1. Trapeze Hangers fabricated of Bolted Angles or Channels.



D. Where Building Construction is Inadequate

1. Provide Additional Framing.
2. Submit for Review.

3.5 EXPANSION DEVICES

- A. Expansion anchors: Similar to Hilti "Drop-In Anchor HDI" flush type.
- B. Drill concrete to receive required expansion cases on concrete fasteners.
- C. Install in shear only, not in tension.

3.6 EQUIPMENT BASES AND SUPPORTS

- A. Provide rigid anchors for ducts and pipes immediately after vibration connections to equipment.
- B. Refer to Specification Section 15050 for additional information.
- C. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
- D. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.7 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding appearance and quality of welds, and methods used in correcting welding work, and with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base-metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.8 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.9 PAINTING

- A. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

- 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION