# SECTION 23 05 29

# HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

# BASED ON DFD MASTER SPECIFICATION DATED 03/08/2024

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

# P A R T 1 - G E N E R A L

## SCOPE

This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Reference

Reference Standards

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Description

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Design Criteria

PART 2 - PRODUCTS

Pipe Hanger and Support Manufacturers

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Structural Supports

Pipe Hangers and Supports

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Primer and Paint for Structural Steel for the Support, Guiding and Anchoring of Steam, Condensate, and Compressed Air Distribution Piping

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Supports, Guides, Hangers, Columns, Beams and Plates in Utility Tunnels, Steam Box Conduit, Steam Pits and Mechanical Rooms

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Construction Verification

## RELATED WORK

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment

Section 23 07 00 - HVAC Insulation

## REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

## REFERENCE STANDARDS

MSS SP-58 Materials, Design, Manufacture, Selection, Application, and Installation

## QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

## DESCRIPTION

Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.

Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

Protect insulation at all hanger points; see Related Work above.

## SUBMITTALS

Refer to division 1, General Conditions, Submittals and 01 33 00 Electronic Submittal Procedures.

Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference section 23 05 00.

All submittals are to comply with submission and content requirements specified in specification Section 01 91 01 or 01 91 02.

## DESIGN CRITERIA

Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 unless noted otherwise.

Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

Piping flexible connections and vibration isolation supports are required for piping connected to coils that are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation supports are required for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not required when the fan section is separately and independently isolated by means of vibration supports and duct flexible connections. Standard pipe hangers/supports as specified in this section are required when there are no vibration isolation devices in the piping and beyond the 100 pipe diameter/3 support distance.

Piping supported by laying on the bottom chord of joists or trusses will not be accepted.

Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

# P A R T 2 - P R O D U C T S

## PIPE HANGER AND SUPPORT MANUFACTURERS

Anvil, B-Line, G-Strut, Fee and Mason, FNW, Kindorf, Michigan Hanger, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by other manufacturers is acceptable.

## STRUCTURAL SUPPORTS

Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

## PIPE HANGERS AND SUPPORTS

HANGERS FOR STEEL PIPE SIZES 1/2” THROUGH 2”:

Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.

Verify expansion and movement of all pipe services and specify pipe shields as indicated in specification section 23 07 00 – HVAC Insulation to allow for movement of the piping.

HANGERS FOR STEEL PIPE SIZES 2-1/2” AND OVER:

Carbon steel, adjustable, clevis, black finish. Anvil figure 260.

Standard pipe hangers. Verify expansion and movement of all pipe services and specify the use of roller hangers where applicable.

Adjustable steel yoke, cast iron roll, double hanger. Anvil figure 181.

At a minimum specify roller hangers for use on hot piping. This includes LPS, HPS and any other services with a fluid temperature over 220°F. Verify expansion and movement of all pipe services and specify the use of roller hangers where applicable.

MULTIPLE OR TRAPEZE HANGERS:

Steel channels with welded spacers and hanger rods if calculations are submitted.

WALL SUPPORT:

Welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series.

Perforated epoxy painted finish, 16-12 gauge min., steel channels securely anchored to wall structure with interlocking, split type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Anvil type AS200 H with AS 1200 clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Anvil cushion clamp assembly.

VERTICAL RISER SUPPORT:

Carbon steel riser clamp, copper plated when used with copper pipe. Anvil figure 261 for steel pipe, figure CT121 for copper pipe.

FLOOR SUPPORT FOR PIPE SIZES THROUGH 4”:

Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

FLOOR SUPPORT FOR PIPE SIZES 5” AND OVER:

Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

COPPER PIPE SUPPORT:

Carbon steel ring, adjustable, copper plated or polyvinylchloride coated.

INSULATION PROTECTION SHIELDS:

Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2 inch and larger. Minimum shield length is 12 inches. Equal to Anvil figure 167.

STEEL HANGER RODS:

Threaded both ends, threaded one end, or continuous threaded, black finish.

Size rods for individual hangers and trapeze support as indicated in the following schedule.

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

| **Maximum Load (Lbs.)** | **Rod Diameter** |
| --- | --- |
| **(650°F Maximum Temp.)** | **(inches)** |
| 610 | 3/8 |
| 1130 | 1/2 |
| 1810 | 5/8 |
| 2710 | 3/4 |
| 3770 | 7/8 |
| 4960 | 1 |
| 8000 | 1-1/4 |

Provide rods complete with adjusting and lock nuts.

## WOOD STRUCTURE SUPPORTS

Carbon steel pipe short strap for piping ½” through 2”. Fastened with two No. 24 x 2 (minimum size) wood screws. Anvil Figure 262.

Carbon steel coach screw rods machine threaded on opposite ends, minimum 3/8” diameter . Anvil Figure 142.

Carbon steel side beam bracket with minimum 3/8” rod size and fastened with minimum ½” x 3” lag screws. Anvil Figure 207

Not intended to be used to support equipment from wood structures. AE must coordinate the pipe weights with the structural design consultant for all pipe sizes.

## BEAM CLAMPS

MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of 3/8, 1/2, and 5/8 inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Anvil figure 86.

MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Anvil figure 228.

A/E must coordinate the pipe weights with the structural design consultant for all pipe sizes.

## CONCRETE INSERTS

Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

## ANCHORS

Use welding steel shapes, plates, and bars to secure piping to the structure.

## ROOF MOUNTED SUPPORTS

Roller supports are required on all roof mounted pipe so that expansion in the roof structure as well as in the pipe can be accommodated. If the pipe is anchored securely to the support and no provisions are made for expansion and contraction of the materials, the mechanical equipment, the support, and/or the connection to the structure will eventually fail and cause a roof leak.

Heights less than indicated cause two problems. First, flashing is difficult to install properly with shorter curbs, especially when the roof insulation is at its thickest point at the curb location. Second, it is very difficult to re-roof below an area that has pipe installed close to the roof surface; some of the equipment used in the re-roofing process does not fit below the pipe unless it is installed at the heights indicated.

HEIGHT OF SUPPORTS:

Based on the length of the longest main support member, the height of the support member above the roof deck to be as follows:

| **Length of Longest Support** | **Min. Height of Support** |
| --- | --- |
| **Member (inches)** | **Above Finished Roof** |
| Up to 36” | 18 inches |
| 37” and Over | 36 inches |

SUPPORTS 18” OR LESS IN HEIGHT:

Prefabricated Metal Sleeper Curb:

Constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load with no penetrations through the curb flashing, inside and outside corner sections that are mitered and continuously welded, filled with 3 pound density rigid fiberglass insulation, integral deck mounting flange, nominal two inch wood nailer, galvanized steel counter flashing with metal receiver cap Attach a galvanized steel channel track for securing pipe or duct roller and roller support. Do not use built-in metal base flashings or cants.

Wood Build Sleeper Curb:

Constructed of wood blocking anchored to the deck. The curb must be structurally capable of supporting the intended load with no penetrations through the curb flashing. Galvanized steel counter flashing with metal receiver cap. Attach a steel channel track for securing pipe or duct roller support. Do not use built-in metal base flashings or cants.

Cant strips are to be provided by the contractor; coordinate with the architect.

Use galvanized structural steel members supported by pipe supports and use pipe or duct rollers fastened to the structural member. Pipe supports to be secured to the roof structure and sealed per pipe penetrations through roof specifications as specified in this section.

SUPPORTS 36” OR MORE IN HEIGHT:

Roof Support Stand/Equipment Roof Support Stand:

Use galvanized structural steel members supported by pipe supports and use pipe or duct rollers fastened to the structural member. Pipe supports to be secured to the roof structure and sealed per pipe penetrations through roof specifications as specified in this section

## EQUIPMENT CURBS

See comments under Roof Mounted Pipe Roller Support above.

The following specification is intended to be used when the mechanical equipment completely covers the curb and the area below the equipment is not exposed to ambient weather conditions. Equipment manufacturer's curbs that match their equipment will be acceptable if they are approved by the National Roofing Contractors Association.

Prefabricated Metal Curb:

Constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load with no penetrations through the curb flashing, inside and outside corner sections that are mitered and continuously welded, filled with 3 pound density rigid fiberglass insulation, integral deck mounting flange, nominal two inch wood nailer, galvanized steel counter flashing. Do not use built-in metal base flashings or cants. Use 18 inch high equipment curbs where the curb completely surrounds the perimeter of the equipment and there is no roof exposed to the weather.

Wood Build Sleeper Curb:

Constructed of wood blocking and anchored to the deck. The curb must be structurally capable of supporting the intended load with no penetrations through the curb flashing. Galvanized steel counter flashing. Do not use built-in metal base flashings or cants. Use 18 inch high equipment curbs where the curb completely surrounds the perimeter of the equipment and there is no roof exposed to the weather.

Adjust curb height so bottom of louvers is not less than 36" above the roof surface to avoid problems with snow and leaves.

If the mechanical equipment is weatherproofed such that moisture cannot penetrate to the area below the equipment, the final roof surface can be omitted. Compressible insulation is to be installed to fill the entire void space. Coordinate this work with the Architect.

## PIPE PENETRATIONS THROUGH ROOF

Multiple Pipe Penetrations:

Refer to acceptable Equipment Curb types listed above for curb specifications. An 8” high (minimum) curb height is required. The coping cap shall be constructed from laminated acrylic clad thermoplastic (ABS) with graduated step boots to accommodate various size pipes, stainless steel fastening screws for cover, stainless steel band clamps for securing boots around the pipe, and stainless steel band clamp or mechanical locking seal for securing boots around the ABS coping cap flanges.

Single Pipe Penetrations:

A stack flashing penetration may be utilized for single pipe penetrations through built up roofs and single ply membrane roofs. Utilize high temperature sealant for all high temperature applications. This includes but is not limited to steam condensate vent piping, steam safety relief piping, and flues.

A single pre-manufactured boot may be utilized for single pipe penetrations through single ply membrane roofs only.

## PRIMER AND PAINT FOR STRUCTURAL STEEL FOR THE SUPPORT, GUIDING AND ANCHORING OF STEAM, CONDENSATE, AND COMPRESSED AIR DISTRIBUTION PIPING

Primer: One coat of Sherwin Williams Epo-Phen FF or approved Equal. Primer shall be suitable for temperature of at least 425° F Continuous, 450°F Intermittent. 7 DMils thickness. Shop applied.

Finish Coat: Additional two coats of Sherwin Williams KEM HI TEMP Heat Flex II 500. Finish Coat shall be suitable for continuous temperature to at least 450° F.

***For low odor or sensitive areas use the following top coat:***

Finish Coat: Low odor, high solids, water-based epoxy coating equal to TNEMEC Typoxy Series 27WB 250 °F continuous service. Color Gray.

## PRIMER AND PAINT FOR STEAM AND CONDENSATE DISTRIBUTION SYSTEMS PIPE WELDS

Primer: 450°F minimum continuous temperature rated corrosion resistant primer. Rustoleum High Heat Primer, V2100 or equal. 3 DMils thickness.

Finish coat: 450°F minimum continuous temperature rated corrosion resistant primer or paint. Rustoleum V2100 or equal. 3 DMils thickness.

Include the above paragraphs ONLY if project has steam distribution.

## CORROSIVE ATMOSPHERE COATINGS

Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface, each side. Mechanical galvanized threaded products, ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.

AE to edit list to match project requirements.

Corrosive atmospheres include the following locations:

* Exterior locations
* Parking ramps
* Swimming pool equipment rooms
* Chemical storage and hazardous waste storage rooms
* Wet wells
* Sanitary pumping stations
* Food service/kitchen areas
* Walk-in coolers/freezers
* Locker/shower rooms
* Greenhouses
* Meter Pits

# P A R T 3 - E X E C U T I O N

## INSTALLATION

Install supports to provide for free expansion of the piping and duct system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

Piping shall be supported independently from ductwork and all other trades.

It may not be possible to meet this requirement on every project. If this requirement cannot be met, details must be created, locations shown, and all of the information approved by the DFD HVAC reviewer prior to issuing bid documents.

Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes for the supporting steel.

Trim steel hanger rods to within one inch of the final lock nut position. Hanger and support cutoff burrs shall be removed and sharp edges ground smooth.

Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

## HANGER AND SUPPORT SPACING

Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of this specification.

Space hangers for pipe as follows:

| **Pipe Material** | **Pipe Size** | **Max. Spacing**  **Horizontal** | **Max Spacing**  **Vertical** |
| --- | --- | --- | --- |
| Steel | 1/2" through 1-1/4" | 6'-6" | 15’-0” |
| Steel | 1-1/2" through 6" | 10'-0" | 15’-0” |
| Steel | 8" through 12" | 12'-0" | 15’-0” |
| Steel | 14" and over | 12'-0" | 15’-0” |
| Thermoplastic | All sizes | 4'-0" | 10’-0” |
| Copper | 1/2" through | 5'-0" | 10’-0” |
| Copper | 1-1/2" and larger | 8'-0" | 10’-0” |

When thermoplastic pipe is used, verify that the spacing above is suitable for the temperatures involved.

## SUPPORTS, GUIDES, HANGERS, COLUMNS, BEAMS AND PLATES IN UTILITY TUNNEL, STEAM BOX CONDUIT, STEAM PITS AND MECHANICAL ROOMS

Turn over all anchor, guide and support steel that is to be cast-in-place to the General Prime Contractor.

All non-cast in place support, guide or anchor steel members/assemblies shall be installed by Mechanical Contractor.

Provide shop fabricated and coated steel for pipe supports, guides, columns, beams, stanchions and plates.

Provide all anchor bolts for the supports, anchors, guides, stanchions, columns and beams used for the pipe supports.

Anchor bolts shall be 316 stainless steel. Post installed anchors shall be installed in accordance with the current ICC-ES Criteria. All installers shall be ICC-ES certified for post installed anchors.

## GUIDES

Provide pipe guide assembly at each guide location as detailed on plans.

## PIPE SADDLES

Provide pipe saddles at each support location as detailed on plans.

## SURFACE PREPARATION AND COATING SCHEDULE

Provide surface preparation and coating for the following:

* All structural steel supports, guides, anchors and pipe support hangers for steam, condensate and air distribution piping.

All surfaces of new support steel (guides, anchors, supports, excreta) shall be prepped and coated. Including but not limited to: front, back, sides, bolt holes, top, bottom and recesses.

All accessible surfaces of existing steel (guides, anchors, supports, excreta) shall be prepped and coated. Including but not limited to: front, back, sides, bolt holes, top, bottom and recesses.

Contractor shall provide temporary enclosures and heat for the field applied coating when surface temperatures are below coating manufacturers recommended temperatures of 50° F and at least 5° F above the dew point temperature.

Provide field coating at all field welds to include preparation in accordance with the manufacture’s recommendations.

Provide surface preparation in accordance with the coating manufacturers recommendations.

## VERTICAL RISER CLAMPS

Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor at a minimum. Mid-story supports may be necessary to meet the requirements listed above.

DFD requires every vertical pipe riser be evaluated by the AE and proper isolation, expansion compensation and support be provided. List all information on the drawings and add all support and isolator information to the project specification.

## ANCHORS

Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

Show all anchors on the drawings and/or details so the contractor understands the design intent. It is not acceptable to let the contractor determine where anchors should be located.

## ROOF MOUNTED SUPPORTS

Use for all pipe and ductwork on roof. Secure bottom of support flat on roof deck. Apply two coats of zinc rich paint to cut edges of all galvanized steel elements. Flashing and counter flashing by the Division 07 Contractor.

Add requirements specific to the project.

## EQUIPMENT CURBS

Secure bottom of support flat on roof deck. Secure equipment to curb in accordance with equipment manufacturer's instructions. Flashing and counter flashing by the Division 07 Contractor.

Fill the entire void space with compressible fiberglass insulation.

Coordinate flashing responsibilities with architect.

## PIPE PENETRATION THROUGH ROOF

Install at points where pipes penetrate roof. Install as shown on the drawings, as detailed and according to the manufacturer's installation instructions. Flashing and counterflashing by the Division 07 Contractor.

Coordinate flashing responsibilities with architect.

## CONSTRUCTION VERIFICATION

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 23 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

END OF SECTION