

SECTION 40 05 15
PIPING SUPPORT SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
 2. American Society of Mechanical Engineers (ASME): B31.1, Power Piping.
 3. ASTM International (ASTM):
 - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - c. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 4. International Code Council (ICC):
 5. International Building Code (IBC).
 6. International Mechanical Code (IMC).
 7. Manufacturers' Standardization Society (MSS):
 - a. SP 58, Pipe Hangers and Supports—Materials, Design and Manufacture.
 - b. SP 127, Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, and Application.
- B. Refer to Area Classification and Material Selection Table as shown on the Drawings for information about specific piping support material requirements for specific project facilities, rooms or areas.

1.02 DEFINITIONS

- A. Wetted or Submerged: Submerged, less than 1 foot above liquid surface, below top of channel wall, under cover or slab of channel or tank, or in other damp locations.
- B. Piping Support: Supports for process and plumbing piping and FRP ductwork.

1.03 SUBMITTALS

A. Action Submittals:

1. Catalog information and drawings of piping support system, locating each support, sway brace, seismic brace, hanger, guide, component, and anchor for piping. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.
2. Calculations for each type of pipe support for piping 3 inches and larger, attachment, and anchor. Support loads to include pipe material, fittings, valves, instruments, and any other piping specialty fittings, plus the fluid being conveyed, if data is not available on the fluid being conveyed follow the IBC/IFC standard of 10 pounds per gallon of fluid. Calculations are also to take wind and seismic loads into account. Calculation shall demonstrate that the support, attachment and anchorage can support equal to or more than the loading placed upon it by the piping system and conveyed fluid.
3. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.
4. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Component and attachment testing seismic certificate of compliance as required by Section 01 45 33, Special Inspection, Observation, and Testing.
3. Maintenance information on piping support system.

1.04 QUALIFICATIONS

- #### A.
- Piping support systems calculations and associated Shop Drawings shall be designed, prepared, and sealed by a registered professional engineer in the state of Arizona.

1.05 DESIGN REQUIREMENTS

A. General:

1. Process Air (PA) Piping Supports: Are designed and detailed on the Drawings and in the Standard Details. The Contractor shall provide and install the PA Piping supports per the Contract Documents.
2. All Other Piping: Piping support systems are shown throughout and around facilities. Standard Details provided separately indicate the general type of support required. Additional pipe supports or differing

pipe support types may be required in addition to those shown on those Drawings. It is the responsibility of the Contractor and/or subcontractor designing the systems to design, size and locate piping supports throughout the facilities whether shown or not. If, by opinion of the Contractor or designated Subcontractor, additional piping support types or quantities are required, Contractor shall submit the suggested support systems with calculations and drawing details to the Contracting Officer for review and acceptance. The absence of pipe supports and details on the Drawings does not relieve the Contractor of responsibility for sizing and providing piping supports throughout and around facilities.

3. Meet requirements of MSS SP 58 and ASME B31.1 or as modified by this section.

B. Pipe Support Systems:

1. Pipe support systems shall be designed for gravity and thrust loads imposed by weight of pipes or internal pressures, including insulation and weight of fluid in pipes.
2. Seismic loads in accordance with governing codes and as shown on Structural General Drawings.
3. Wind loads for exterior above grade piping in accordance with governing codes and as shown on Structural General Drawings.
4. Maximum Support Spacing and Minimum Rod Size: In accordance MSS SP 58 Table 3 and Table 4.
 - a. Ductile-iron Pipe 8 Inches and Under: Maximum span limited to that for standard weight steel pipe for water service.
 - b. Ductile-iron Pipe 10 Inches and Larger: Maximum span limited to 20 feet.
5. Electrical Conduit Support: Include in design of framing support system.

C. Anchoring Devices: Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear and pullout loads imposed by loading and spacing on each particular support, and seismic forces.

D. Vertical Sway Bracing: 10-foot maximum centers or as shown.

E. Existing Support Systems: Use of existing supports systems to support new piping only if Contractor can show they are adequate for additional load, or if they are strengthened to support additional load.

PART 2 PRODUCTS

2.01 GENERAL

- A. When specified items are not available, fabricate pipe supports of correct material and to general configuration indicated.
- B. Special support and hanger details may be required for cases where standard catalog supports are not applicable.
- C. Materials: In accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
- D. Physical Characteristics: As described in subsections below.
- E. Functional Characteristics: As described in subsections below.
- F. Performance Characteristics: As described in subsections below.

2.02 HANGERS

- A. Clevis: MSS SP 58, Type 1.
 - 1. Manufacturers and Products:
 - a. Non-Insulated Pipe:
 - 1) Anvil; Figure 260 for steel pipe and Figure 590 for ductile-iron pipe, sizes 1/2 inch through 30 inches.
 - 2) Or equal.
 - b. Insulated Pipe:
 - 1) Anvil; Figure 260 ISS with insulated saddle system, sizes 1/2 inch through 16 inches.
 - 2) Or equal.
 - 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - 3. Functional Characteristics:
 - a. Designed to support individual pipes hanging from above structure.
 - b. Where pipe is insulated the clevis hanger configuration is to support the pipe while accommodating pipe insulation.
 - 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

- B. Adjustable Swivel Split-Ring Pipe Clamp: MSS SP 58, Type 6.
1. Manufacturers and Products:
 - a. Anvil; Figure 104, sizes 3/4 inch through 8 inches.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics:
 - a. Designed to support individual pipes hanging from above structure.
 - b. Similar to Clevis hanger but only for non-insulated pipes and features an off-center hinger closure for pipe install.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
- C. Steel Yoke Pipe Rolls and Roller Supports: MSS SP 58, Type 41 or Type 43.
1. Manufacturers and Products:
 - a. Anvil; Figure 181 for sizes 2-1/2 inches through 24 inches, and Figure 171 for sizes 1 inch through 30 inches.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics:
 - a. Designed to support individual pipes hanging from above structure.
 - b. Similar to Clevis hanger however the lower support is a non-conductive pipe roller to allow longitudinal movement of pipe without damaging protective coatings.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
- D. Pipe Rollers and Supports: MSS SP 58, Type 44.
1. Manufacturers and Products:
 - a. Anvil; Figure 175, sizes 2 inches through 30 inches.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.

3. Functional Characteristics:
 - a. Designed to support individual pipes from structure below.
 - b. This pipe support bolts to structure below to provide support for an individual pipe on a roller to allow longitudinal movement of pipe without damaging protective coatings.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.03 WALL BRACKETS, SUPPORTS, AND GUIDES

A. Welded Steel Wall Bracket: MSS SP 58, Type 33 (heavy-duty).

1. Manufacturers and Products:
 - a. Anvil; Figure 199, 3,000-pound rating.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: Heavy welded steel brace bracket designed to attach a wall or other vertical surface to which multiple or individual pipe restraints can be bolted.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

B. Adjustable “J” hanger MSS SP 58, Type 5:

1. Manufacturers and Products:
 - a. Anvil; Figure 67, sizes 1/2 inch through 8 inches.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics:
 - a. Designed to support individual pipes from sidewall or hanging from structure above.
 - b. This pipe support bolts to sidewall or hangs for rod to provide support for an individual pipe using a metal strap with retaining bolt to allow longitudinal movement of pipe without damaging protective coatings. Pipe be set or installed in support after support is mounted.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

C. Offset Pipe Clamp:

1. Manufacturers and Products:
 - a. Anvil; Figure 103, sizes 3/4 inch through 8 inches.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics:
 - a. Designed to support individual pipes from structure below.
 - b. This pipe support bolts to structure below to provide support for an individual pipe with a restraining strap bolting across top. For use in either vertical or horizontal install to keep off mounting surface (wall or floor).
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.04 PIPE SADDLES

A. Provide 90-degree to 120-degree pipe saddle for pipe 6 inches and larger with baseplates drilled for anchor bolts.

1. In accordance with Standard Detail 4005-515.

B. Saddle Supports, Pedestal Type:

1. Nonadjustable Saddle: MSS SP 58, Type 37 with U-bolt.
 - a. Manufacturers and Products:
 - 1) Anvil; Figure 259, sizes 4 inches through 36 inches with Figure 63C base.
 - 2) Or equal.
 - b. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - c. Functional Characteristics: Pipe saddle support with U-bolt and yoke to provide stability.
 - d. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2. Adjustable Saddle: MSS SP 58, Type 38 without clamp.
 - a. Manufacturers and Products:
 - 1) Anvil; Figure 264, sizes 2-1/2 inches through 36 inches with Figure 62C base.
 - 2) Or equal.
 - b. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - c. Functional Characteristics: Adjustable saddle without U-bolt, adjustable stanchion with threaded lock nut.
 - d. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.05 CHANNEL TYPE SUPPORT SYSTEMS

A. Channel Size: 12-gauge, 1-5/8-inch wide minimum.

1. Manufacturers and Products:
 - a. Atkore, Unistrut.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: Pre-engineered standardize channel system, minimum 12-gauge material designed to work a wide range of pipe clamps, restrains, supports and hardware. For mounting and supporting piping and other construction elements to floors, walls, ceilings, and suspended from structures to for trapeze for single or multiple pipe supports.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.06 PIPE CLAMPS

A. Riser Clamp: MSS SP 58, Type 8.

1. Manufacturers and Products:
 - a. Anvil; Figure 261, sizes 3/4 inch through 24 inches.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.

3. Functional Characteristics: For support of single stationary steel or cast-iron pipe or conduit. Not for use with rod hangers.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.07 ELBOW AND FLANGE SUPPORTS

A. Elbow with Adjustable Stanchion: Sizes 2 inches through 18 inches.

1. Manufacturers and Products:
 - a. Anvil; Figure 62C base.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: For support of single stationary horizontal pipe where vertical adjustment is required.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

B. Elbow with Nonadjustable Stanchion: Sizes 2-1/2 inches through 42 inches.

1. Manufacturers and Products:
 - a. Anvil; Figure 63A or Figure 63B base.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: For support of single stationary pipe at an elbow where no vertical adjustment is required.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

C. Flange Support with Adjustable Base: Sizes 2 inches through 24 inches.

1. Manufacturers and Products:
 - a. Standon; Model S89.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: For support for stationary pipe where vertical adjustment is required, in which support attaches/conforms to pipe flange geometry in lieu of pipe saddle or elbow connection.

4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.08 INTERMEDIATE PIPE GUIDES

- A. Type: U-bolts with double nuts to provide nominal 1/8-inch to 1/4-inch clearance around pipe; MSS SP 58, Type 24.
 1. Manufacturers and Products:
 - a. Anvil; Figure 137 and Figure 137S.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics: U-bolt for anchoring of a single pipe or conduit to supporting structure by through bolting.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.09 PIPE ALIGNMENT GUIDES

- A. Type: Spider pipe alignment guide for pipes with insulation.
 1. Manufacturers and Products:
 - a. Anvil; Figure 255, sizes 1/2 inch through 24 inches.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics: Pipe support and anchor for maintaining piping in axial alignment with insulation, allowing for axial expansion of pipe, with support anchoring to flat support structure from below.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.10 SEISMIC RESTRAINTS

- A. Solid pipe bracing attachment to pipe clevis with clevis cross brace and angle rod reinforcement.
 1. Manufacturers and Products:
 - a. Anvil; Figure AF775 with pipe brace.
 - b. Or equal.

2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: Longitudinal and/or lateral Seismic Pipe support bracket which attached to pipe restraint bracket and provide lateral seismic support using a brace pipe to structure.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

2.11 ACCESSORIES

A. Anchor Bolts:

1. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
2. Functional Characteristics:
 - a. Size and Material: Sized by Contractor for required loads, 1/2-inch minimum diameter, and as specified in Section 05 50 00, Metal Fabrications.
 - b. Bolt Length (Extension Above Top of Nut):
 - 1) Minimum Length: Flush with top of nut preferred. If not flush, shall be no more than one thread recessed below top of nut.
 - 2) Maximum Length: No more than a full nut depth above top of nut.
3. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

B. Dielectric Barriers: Plastic isolation cushion, or tape.

1. Manufacturers and Products:
 - a. B-Line; B1999 Vibra Cushion.
 - b. Or equal.
2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
3. Functional Characteristics: Dielectric barrier / vibration cushion tape to flexible and made from nonconductive materials.
4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

- C. Insulation Shields: Galvanized steel or stainless steel, MSS SP 58, Type 40.
1. Manufacturers and Products:
 - a. Anvil; Figure 167, sizes 1/2 inch through 24 inches.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics: Insulation shield to provide extended support of pipe at clevis pipe support or similar point loading supports to distribute the loading to protect the pipe insulation for being crushed or damage to insulation cover.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
- D. Welding Insulation Saddles: Type MSS SP 58, Type 39.
1. Manufacturers and Products:
 - a. Anvil; Figure Series 160, sizes 1 inch through 36 inches.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics: Insulation saddles provide extended support of pipe where the pipe is support from below to protect the pipe insulation for being crushed or damage to insulation cover.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
- E. Plastic Pipe Support Channel:
1. Manufacturers and Products:
 - a. B-Line; Figure Series B3106V, sizes 1/2 inch through 6 inches with Figure B3106 Vee bottom hanger.
 - b. Or equal.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics: Support channel provides continuous support of plastic pipe between pipe supports.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

- F. Hanger Rods, Clevises, Nuts, Sockets, and Turnbuckles: In accordance with MSS SP 58.
1. Manufacturers and Products: No specific manufacturer.
 2. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 3. Functional Characteristics: Hardware compatible with pipe supports for size, load capacity and materials of construction consistent with physical characteristics noted above.
 4. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
- G. Attachments:
1. I-Beam Clamp: Concentric loading type, MSS SP 58, Type 21, Type 28, Type 29, or Type 30, which engage both sides of flange.
 - a. Manufacturers and Products:
 - 1) Anvil: Figure 133, 134, 218, 228, 292.
 - 2) Or equal.
 - b. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - c. Functional Characteristics: Hardware compatible with pipe supports and I-beam structure for size, load capacity and materials of construction consistent with physical characteristics noted above.
 - d. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
 2. Concrete Insert: MSS SP 58, Type 18, continuous channel insert with load rating not less than that of hanger rod it supports.
 - a. Manufacturers and Products:
 - 1) Anvil: Figure 281 & 282, 1/2 inch and larger.
 - 2) Or equal.
 - b. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - c. Functional Characteristics: Hardware compatible with pipe supports for size, load capacity and materials of construction consistent with physical characteristics noted above.
 - d. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid,

associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

3. Welded Beam Attachment: MSS SP 58, Type 22.
 - a. Manufacturers and Products:
 - 1) Anvil; Figure 66.
 - 2) Or equal.
 - b. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - c. Functional Characteristics: Rod Hanger anchor welded to bottom or I-Beam or other steel structure, for rod hanger 1/2 inch and larger. Hardware compatible with pipe supports for size, load capacity and materials of construction consistent with physical characteristics noted above.
 - d. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.
4. Concrete Attachment Plates:
 - a. Manufacturers and Products:
 - 1) Anvil; Figure 47, Figure 49, or Figure 52.
 - 2) Or equal.
 - b. Physical Characteristics: Materials in accordance with table on Area Classification and Material Selection Table as shown on the Drawings.
 - c. Functional Characteristics: Rod Hanger anchor plate for attachment to concrete surfaces above, for rod hanger 1/2 inch and larger. Hardware compatible with pipe supports for size, load capacity and materials of construction consistent with physical characteristics noted above.
 - d. Performance Characteristics: Pipe support to be rated and designed to support size and weight of piping, including fluid, associated accessories such as heat trace, insulation, valves and/or piping specialties; when installed at specified spacing between pipe supports.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Install support systems in accordance with MSS SP 58, unless shown otherwise.

2. Install pipe hanger rods plumb, within 4 degrees of vertical during shut down, start up or operations.
3. Support piping connections to equipment by pipe support and not by equipment.
4. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
5. Support no pipe from pipe above it.
6. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
7. Do not use adhesive anchors for attachment of supports to ceiling or walls.
8. Do not install pipe supports and hangers in equipment access areas or in monorail hoist or bridge crane runs.
9. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.
10. Install lateral supports for seismic loads at changes in direction.
11. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.
12. Repair mounting surfaces to original condition after attachments are completed.
13. See Area Classification and Material Selection Table on the Drawings for selection of support materials to be used based upon area exposure and conditions.

B. Standard Pipe Supports:

1. Horizontal Suspended Piping:
 - a. Single Pipes: Clevis hangers or adjustable swivel split-ring.
 - b. Grouped Pipes: Trapeze hanger system.
2. Horizontal Piping Supported from Walls:
 - a. Single Pipes: Wall brackets, or attached to wall, or to wall mounted framing with anchors.
 - b. Stacked Piping: Wall mounted framing system and “J” hangers acceptable for pipe smaller than 3 inches.
 - c. Pipe clamp that resists axial movement of pipe through support is not acceptable. Use pipe rollers supported from wall bracket.
3. Horizontal Piping Supported from Floors:
 - a. Saddle Supports:
 - 1) Pedestal Type, elbow and flange.
 - 2) Provide minimum 1-1/2-inch grout beneath baseplate.
 - b. Floor Mounted Channel Supports:
 - 1) Use for pipe smaller than 3-inch running along floors and in trenches at pipe elevations lower than can be accommodated using pedestal pipe supports.

- 2) Attach channel framing to floors with baseplate on minimum 1-1/2-inch nonshrink grout and with anchor bolts.
 - 3) Attach pipe to channel with clips or pipe clamps.
 - c. Concrete Cradles: Use for pipe larger than 3 inches along floor and in trenches at pipe elevations lower than can be accommodated using stanchion type.
 - 4. Insulated Pipe:
 - a. Pipe hanger and support shall be on outside of insulation. Do not enclose within insulation.
 - b. Provide precut 120-degree sections of rigid insulation (minimum length same as shield), shields and oversized hangers or insulated saddle system (ISS).
 - c. Wall-mounted pipe clips not acceptable for insulated piping.
 - 5. Vertical Pipe: Support with wall bracket and elbow support, or riser clamp on floor penetration.
- C. Standard Attachments:
- 1. New Concrete Ceilings:
 - a. Concrete inserts, concrete attachment plates, or concrete anchors as limited below:
 - 1) Single point attachment to ceiling allowed only for 3/4-inch rod and smaller (8 inches and smaller pipe).
 - 2) Where there is vibration or bending considerations, do not connect a single pipe support hanger rod directly to a drilled concrete anchor (single point attachment) regardless of size.
 - 2. Existing Concrete Ceilings:
 - a. Channel type support with minimum of two anchor points, concrete attachment plates or concrete anchors as limited below:
 - 1) Single point attachment to ceiling is allowed only for 3/4-inch rod and smaller (8 inches and smaller pipe).
 - 2) Where there is vibration or bending considerations do not connect a single pipe support hanger rod directly to a drilled concrete anchor (single point attachment) regardless of size.
 - 3. Steel Beams: I-beam clamp or welded attachments.
 - 4. Wooden Beams: Lag screws and angle clips to members not less than 2-1/2 inches thick.
 - 5. Concrete Walls: Concrete inserts or brackets or clip angles with concrete anchors.
 - 6. Concrete Beams: Concrete inserts, or if inserts are not used attach to vertical surface similar to concrete wall. Do not drill into beam bottom.
- D. Saddles for Steel or Concrete Pipe: Provide 90-degree to 120-degree pipe saddle for pipe sizes 6 inches and larger when installed on top of steel or concrete beam or structure, pipe rack, trapeze, or where similar concentrated point supports would be encountered.

E. Intermediate and Pipe Alignment Guides:

1. Provide pipe alignment guides, or pipe supports that provide same function, at expansion joints and loops.
2. Guide pipe on each side of expansion joint or loop at 4 pipe and 14 pipe diameters from each joint or loop.
3. Install intermediate guides on metal framing support systems not carrying pipe anchor or alignment guide.

F. Accessories:

1. Insulation Shield: Install on insulated piping with oversize rollers and supports.
2. Welding Insulation Saddle: Install on insulated steel pipe with oversize rollers and supports.
3. Dielectric Barrier:
 - a. Provide between painted or galvanized carbon steel members and copper or stainless steel pipe or between stainless steel supports and nonstainless steel ferrous metal piping.
 - b. Install rubber wrap between submerged metal pipe and oversized clamps.

END OF SECTION

