SECTION 220529 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 22 0500 "Common Work Results for Plumbing" all apply to the work of this Section as if fully repeated herein.

1.2 SUMMARY

A. This Section includes hangers and supports for Division 22 piping and equipment:
1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.

B. Related Sections include the following:
1. Division 05 Section “Metals, Structural Steel” for materials for attaching hangers and supports to building structure.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, “Guidelines on Terminology for Pipe Hangers and Supports.”

1.4 PERFORMANCE REQUIREMENTS

A. If contractor elects to apply channel support systems and/or heavy-duty steel trapezes to support multiple pipes, in lieu of individual supports, then contractor is responsible for design of same capable of supporting combined weight of supported systems, system contents, and test water.

B. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. All pipe hangers, supports, inserts, including hanger/support coatings located within plenum

ceilings shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 complying with ASTM E 84.

1.5 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated. Include:
1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.
4. Trapeze pipe hangers. Include Product Data for components.
5. Metal framing systems. Include Product Data for components.

B. Shop Drawings: Signed and sealed shop drawings by a qualified professional engineer are required for all custom pipe and equipment hangers and supports, and all supports for piping larger than 20-inch NPS. Show fabrication and installation details and include calculations.

C. Welding Certificates: Copies of certificates for welding procedures and operators.

1.6 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, “Welding and Brazing Qualifications.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Manufactured Pipe Hangers:
   a. B-Line Systems, Inc.
   b. Carpenter & Patterson, Inc.
   c. Grinnell Corp.
   d. Michigan Hanger Co., Inc.
   e. Tolco division of NIBCO, Inc.
   f. Anvil International; a subsidiary of Mueller Water Products Inc.
2. Channel Support Systems:
   a. B-Line Systems, Inc.
   b. Grinnell Corp.; Power-Strut Unit.
   c. Tolco division of NIBCO, Inc.
   d. Unistrut Corp.
3. Thermal-Hanger Shield Inserts:
   a. Carpenter & Patterson, Inc.
   b. Michigan Hanger Co., Inc.
   c. Pipe Shields, Inc.
4. Powder-Actuated Fastener Systems:
   a. Hilti, Inc.

b. ITW Ramset/Red Head.
c. Simpson Manufacturing Co.; Strong-Tie Anchor Systems Div.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to “Hanger and Support Applications” Article in Part 3 for where to use specific hanger and support types.
1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Trapeze: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

C. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
1. Material for piping below ambient temperature: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
2. Material for piping above ambient temperature: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
4. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
5. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 MISCELLANEOUS MATERIALS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

C. Pipe Anchors and Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.

D. 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 HANGER AND SUPPORT SCHEDULE OF APPLICATIONS

A. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in this Section.

B. Horizontal-Piping Hangers and Supports for the first three hangers/supports or the first 50-feet (whichever is greater) adjacent to pumps: Use spring hangers and supports. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports shall include the following types:
1. Horizontal (MSS Type 54): Mounted horizontally.
2. Vertical (MSS Type 55): Mounted vertically.
3. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

C. Horizontal-Piping Hangers and Supports for individual, insulated pipe runs which are both 2½-inch diameter or larger and 20 feet or longer: Unless otherwise indicated, choose among the following types:
1. Single Pipe Rolls (MSS Type 41): For suspension of pipes from two rods.
2. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes from single rod.
3. Complete Pipe Rolls (MSS Type 44): Where vertical adjustment is not necessary.
4. Adjustable Pipe Roll and Base Units (MSS Type 46): For vertical and lateral adjustment.

D. Horizontal-Piping Hangers and Supports for individual pipe runs less than 20 feet long and all piping 2-inch diameter or smaller, regardless of length: Unless otherwise indicated, choose among the following types:
1. Adjustable Steel Clevis Hangers (MSS Type 1).
2. Yoke-Type Pipe Clamps (MSS Type 2): For pipes NPS 4 and larger.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3).
4. Steel Pipe Clamps (MSS Type 4).

E. Horizontal-Piping Hangers and Supports for individual uninsulated pipe runs of any size or length: Unless otherwise indicated, choose among the following types:
1. Adjustable Steel Clevis Hangers (MSS Type 1).
2. Yoke-Type Pipe Clamps (MSS Type 2): For pipes NPS 4 and larger.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3).
4. Steel Pipe Clamps (MSS Type 4).
5. Adjustable Steel Band Hangers (MSS Type 7): For pipes up to NPS 2 only.
6. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For pipes up to NPS 2 only.
7. U-Bolts (MSS Type 24).

F. Vertical-Piping Hangers and Supports for individual, insulated pipe runs which are both 2½-inch diameter or larger and 20 feet or longer: Use spring hangers and supports. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports shall include the following types:
1. Horizontal (MSS Type 54): Mounted horizontally.
2. Vertical (MSS Type 55): Mounted vertically.
3. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

G. Vertical-Piping Hangers and Supports for individual pipe runs less than 20 feet long and all piping 2-inch diameter or smaller, regardless of length: Unless otherwise indicated, choose among the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): Where longer ends are required.
3. Vertical-Piping Hangers and Supports for individual uninsulated pipe runs of any size or length: Unless otherwise indicated, choose among the following types:
4. Extension Pipe or Riser Clamps (MSS Type 8).
5. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): Where longer ends are required.

H. Hanger-Rod Attachments: Unless otherwise indicated, choose among the following types:
1. Steel Turnbuckles (MSS Type 13).
2. Steel Clevises (MSS Type 14).
3. Malleable-Iron Sockets (MSS Type 16).
4. Steel Weldless Eye Nuts (MSS Type 17).

I. Building Attachments: Unless otherwise indicated, choose among the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to concrete ceiling.
2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
3. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams.
4. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
5. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.
6. Side-Beam Brackets (MSS Type 34): For sides of steel beams.
7. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

3.2 HANGER AND SUPPORT SCHEDULE OF SPACING AND ROD SIZE

A. Steel Piping: Install hangers with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 4 feet; minimum rod size, 3/8 inch.
2. NPS 3/4: Maximum span, 5 feet; minimum rod size, 3/8 inch.
3. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 1/2 inch.
8. NPS 3: Maximum span, 12 feet; minimum rod size, 1/2 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 5/8 inch.
10. NPS 6: Maximum span, 12 feet; minimum rod size, 3/4 inch.
11. NPS 8: Maximum span, 12 feet; minimum rod size, 5/8 inch.

B. Copper Tubing: Install hangers with the following maximum horizontal spacing and minimum rod diameters.
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and 1-1/4: 72 inches with 3/8-inch rod.
   3. NPS 1 1/2 and NPS 2: 96 inches with 3/8-inch rod.
   4. NPS 3 and NPS 4: 96 inches with 1/2-inch rod.

C. Cast-iron Soil Piping: Install hangers with the following maximum horizontal spacing and minimum rod diameters.
   1. NPS 1 1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

D. Install supports for vertical cast-iron soil piping every 15 feet.

E. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
   2. NPS 3: 48 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
   4. NPS 6 to NPS 8: 48 inches with 3/4-inch rod.
   5. NPS 10 to NPS 12: 48 inches with 7/8-inch rod.

F. Install supports for vertical PVC every 48 inches.

G. Rod diameters may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

H. Hanger and support spacing for piping and tubing not listed above shall be according to MSS SP-69 and piping manufacturer's written instructions.

3.3 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

C. Field assemble and install according to manufacturer's written instructions.

D. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

E. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

F. Field fabricate from ASTM A 36, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

G. Install building attachments within concrete slabs or attach to structural steel. Space

attachments within maximum piping span length indicated in this Section. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

H. Install powder-actuated drive-pin fasteners in concrete. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

I. Install mechanical-anchor fasteners in concrete. Install fasteners according to manufacturer's written instructions.

J. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

K. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, “Building Services Piping,” is not exceeded.

3.4 PROTECTION OF INSULATED PIPING

A. Do not exceed pipe stress limits according to ASME B31.9.

B. Piping Operating above Ambient Air Temperature: Clevis- and clamp-type supports may project through insulation. For piping on roller-type supports, install MSS SP-58, Type 39 protection saddles, and fill interior voids with insulation that matches adjoining insulation.
   1. Option: Thermal-hanger shield inserts may be used. Insert shall be same thickness as adjoining pipe insulation and length shall be at least as long as the protective shield. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

C. Piping Operating below Ambient Air Temperature: Install MSS SP-58, Type 40 protective shields.

D. Pipe Sizes NPS 4 and larger: Include thermal-hanger shield inserts. Insert shall be same thickness as adjoining pipe insulation and length shall be at least as long as the protective shield. Include steel weight-distribution plate if pipe is installed on rollers.

E. Shield Dimensions for Pipe: Not less than the following:
   1. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   2. NPS 4: 12 inches long and 0.06 inch thick.
   3. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   4. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   5. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

3.5 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.

3.6 ADJUSTING

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

B. Trim excess length of continuous-thread hanger and support rods to 1½ inches (40 mm).

3.7 PAINTING

A. Touching Up: 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.

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

C. Touch Up Paint: Touchup paint for field welds, bolted connections, and abraded areas on miscellaneous metal is specified in Division 09 Section “Painting.”

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

END OF SECTION 23 0529