SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Metal pipe hangers and supports.

Trapeze pipe hangers.

Fiberglass pipe hangers.

Metal framing systems.

Fiberglass strut systems.

Thermal hanger-shield inserts.

Fastener systems.

Pipe stands.

Pipe-positioning systems.

Equipment supports.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

[**Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"**] [**Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment"**] for vibration isolation devices.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer's installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.
				5. Shop Drawings:[**Signed and sealed by a qualified professional Director’s Representative.**] Show fabrication and installation details and include calculations for the following:

Trapeze pipe hangers.

Metal framing systems.

Fiberglass strut systems.

Pipe stands.

Equipment supports.

Retain "Delegated-Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional Director’s Representative responsible for their preparation.

Detail fabrication and assembly of trapeze hangers.

Include design calculations for designing trapeze hangers.

Retain "Welding certificates" paragraph below if retaining "Structural-Steel Welding Qualifications" paragraph and "Pipe Welding Qualifications" paragraph in "Quality Assurance" Article.

* + - * 1. Welding certificates.
			1. QUALITY ASSURANCE

Retain both "Structural-Steel Welding Qualifications" paragraph and "Pipe Welding Qualifications" paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" paragraph in "Informational Submittals" Article.

* + - * 1. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 “Structural Welding Code – Steel”.
				2. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Delegated Design" paragraph below if Contractor is required to assume responsibility for design.

Delegated Design: Engage a qualified professional Director’s Representative to design trapeze pipe hangers and equipment supports.

* + - * 1. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to [**ASCE/SEI 7**] <**Insert requirement**>.

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

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

Design seismic-restraint hangers and supports for piping and equipment[**and obtain approval from authorities having jurisdiction**].

* + - 1. METAL PIPE HANGERS AND SUPPORTS
				1. Carbon-Steel Pipe Hangers and Supports:

Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Types 1 through 58, factory-fabricated components.

Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.

Nonmetallic Coatings: Plastic coated or epoxy powder coated.

Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

Hanger Rods: Continuous-thread rod, nuts, and washer made of [**carbon steel**] [**stainless steel**] <**Insert material**>.

* + - * 1. Stainless-Steel Pipe Hangers and Supports:

Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Types 1 through 58, factory-fabricated components.

Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

Hanger Rods: Continuous-thread rod, nuts, and washer made of [**stainless steel**] <**Insert material**>.

* + - * 1. Copper Pipe and Tube Hangers:

Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Types 1 through 58, copper-coated-steel, factory-fabricated components.

Hanger Rods: Continuous-thread rod, nuts, and washer made of [**copper-coated steel**] [**stainless steel**] <**Insert material**>.

* + - 1. TRAPEZE PIPE HANGERS

Trapeze pipe hanger in "Description" paragraph below requires calculating and detailing at each use.

* + - * 1. Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation” carbon-steel hanger rods, nuts, saddles, and U-bolts.
			1. FIBERGLASS PIPE HANGERS
				1. Clevis-Type, Fiberglass Pipe Hangers:

Description: Similar to MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 1 steel pipe hanger, except hanger is made of fiberglass or fiberglass-reinforced resin.

Hanger rods for fiberglass pipe hangers in "Hanger Rods" subparagraph below are typically stainless steel.

Hanger Rods: Continuous-thread rod, washer, and nuts made of [**fiberglass**] [**polyurethane**] [**or**] [**stainless steel**] <**Insert material**>.

Retain "Flammability" subparagraph below if retaining "fiberglass" or "polyurethane" option in "Hanger Rods" subparagraph above.

Flammability: ASTM D635 “Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position”, ASTM E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”, UL 94 “Classification and Flame-Retardant Thermoplastics”.

* + - * 1. Strap-Type, Fiberglass Pipe Hangers:

Description: Similar to MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 9 or Type 10 steel pipe hanger, except hanger is made of fiberglass-reinforced resin.

Flammability: ASTM D635 “Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position”, ASTM E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”, UL 94 “Classification and Flame-Retardant Thermoplastics”.

Hanger rods and attachments in "Hanger Rod and Fittings" subparagraph below are typically stainless steel.

Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of [**stainless steel**] <**Insert material**>.

* + - 1. METAL FRAMING SYSTEMS

Metal framing systems in this article require calculating and detailing at each use.

Framing systems in "MFMA Manufacturer Metal Framing Systems" paragraph below are made by MFMA members.

* + - * 1. MFMA Manufacturer Metal Framing Systems:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=1829) Subject to compliance with requirements, provide products by one of the following:

[ABB, Electrification Business](http://www.specagent.com/Lookup?uid=123457086623).

[Gregory GSTRUT](http://www.specagent.com/Lookup?uid=123457206543).

[Rocket Rack; Robroy Industries](http://www.specagent.com/Lookup?uid=123457215345).

Or equal.

Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

Standard: Comply with MFMA-4, factory-fabricated components for field assembly.

Channels: Continuous slotted [**carbon-steel**] [**stainless-steel, Type 304**] [**stainless-steel, Type 316**] [**extruded-aluminum**] <**Insert material**> channel with inturned lips.

Channel Width: Selected for applicable load criteria.

Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

Hanger Rods: Continuous-thread rod, nuts, and washer made of [**carbon steel**] [**stainless steel**] <**Insert material**>.

Retain "Metallic Coating," "Paint Coating," "Plastic Coating," or "Combination Coating" subparagraph below for coating. Coordinate coating with material retained in "Channels" subparagraph above.

Metallic Coating: [**No coating**] [**Plain**] [**Pregalvanized G90**] [**Electroplated zinc**] [**Hot-dip galvanized**] [**Gold (yellow zinc dichromate) galvanized**].

Paint Coating: [**Green epoxy, acrylic, or urethane**] <**Insert paint type**>.

Plastic Coating: [**PVC**] <**Insert plastic type**>.

Combination Coating: <**Insert coating materials in order of application**>.

* + - * 1. Non-MFMA Manufacturer Metal Framing Systems:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=1830) Subject to compliance with requirements, provide products by one of the following:

[FNW; Ferguson Enterprises, Inc](http://www.specagent.com/Lookup?uid=123457109209).

[Gripple Inc](http://www.specagent.com/Lookup?uid=123457103658).

[HoldRite; Reliance Worldwide Company](http://www.specagent.com/Lookup?uid=123457158520).

Or equal.

Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

Standard: Comply with MFMA-4, factory-fabricated components for field assembly.

Channels: Continuous slotted [**carbon-steel**] [**stainless-steel**] <**Insert material**> channel with inturned lips.

Channel Width: Select for applicable load criteria.

Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

Hanger Rods: Continuous-thread rod, nuts, and washer made of [**carbon steel**] [**stainless steel**] <**Insert material**>.

Retain "Metallic Coating," "Paint Coating," or "Plastic Coating" subparagraph below for coating. Coordinate coating with material retained in "Channels" subparagraph above.

Metallic Coating: [**No coating**] [**Plain**] [**Pregalvanized G90**] [**Hot-dip galvanized**]

Paint Coating: [**Green epoxy, acrylic, or urethane**] <**Insert paint coating**>.

Plastic Coating: [**PVC**] <**Insert plastic type**>.

* + - 1. FIBERGLASS STRUT SYSTEMS

Fiberglass strut systems in this article require calculating and detailing at each use.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=1831) Subject to compliance with requirements, provide products by one of the following:

[Champion Fiberglass, Inc](http://www.specagent.com/Lookup?uid=123457086635).

[Fabco Plastics Wholesale Limited](http://www.specagent.com/Lookup?uid=123457101420).

[Seasafe, Inc.; AMICO, a Gibraltar Industries Company](http://www.specagent.com/Lookup?uid=123457086637).

Or equal.

* + - * 1. Description: Structural-grade, factory-formed, glass-fiber-resin channels and angles for supporting multiple parallel pipes.

Standard: Comply with MFMA-4, factory-fabricated components for field assembly.

Channels: Continuous slotted fiberglass-reinforced plastic channel with inturned lips.

Channel Width: Selected for applicable load criteria.

Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.

Fitting and Accessory Materials: Same as those for channels and angles[**, except metal items may be stainless steel**].

Rated Strength: Selected to suit applicable load criteria.

Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

* + - 1. THERMAL HANGER-SHIELD INSERTS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=1832) Subject to compliance with requirements, provide products by one of the following:

[Buckaroos, Inc](http://www.specagent.com/Lookup?uid=123457103627).

[Pipe Shields Inc](http://www.specagent.com/Lookup?uid=123457086646).

[Rilco Manufacturing Co., Inc](http://www.specagent.com/Lookup?uid=123457086640).

Or equal.

* + - * 1. Insulation-Insert Material for Cold Piping: [**ASTM C552, Type II cellular glass with 100-psig**] [**or**] [**ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig**] minimum compressive strength and vapor barrier.
				2. Insulation-Insert Material for Hot Piping: [**Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psig**] [**ASTM C552, Type II cellular glass with 100-psig**] [**or**] [**ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig**] minimum compressive strength.
				3. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
				4. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
				5. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
			1. FASTENER SYSTEMS

Verify suitability of fasteners in this article for use in lightweight concrete or concrete slabs less than 4 inches thick. Powder-actuated fasteners may be banned for use in certain occupancies. Consult authorities having jurisdiction and Owner's project requirements.

* + - * 1. 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.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=13286) Subject to compliance with requirements, provide products by one of the following:

[Hilti, Inc](http://www.specagent.com/Lookup?uid=123457101430).

[MKT Fastening, LLC](http://www.specagent.com/Lookup?uid=123457101432).

[Simpson Strong-Tie Co., Inc](http://www.specagent.com/Lookup?uid=123457101433).

Or equal.

* + - * 1. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=13287) Subject to compliance with requirements, provide products by one of the following:

[Cooper B-line; brand of Eaton, Electrical Sector](http://www.specagent.com/Lookup?uid=123457101435).

[Hilti, Inc](http://www.specagent.com/Lookup?uid=123457101437).

[MKT Fastening, LLC](http://www.specagent.com/Lookup?uid=123457101439).

Or equal.

Indoor Applications: [**Zinc-coated**] [**or**] [**stainless**] steel.

Outdoor Applications: Stainless steel.

* + - 1. PIPE STANDS

Pipe stands in this article require calculating and detailing at each use.

* + - * 1. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
				2. Compact Pipe Stand:

Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

Hardware: Galvanized steel or polycarbonate.

Accessories: Protection pads.

* + - * 1. Low-Profile, Single-Base, Single-Pipe Stand:

Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.

Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

Vertical Members: Two [**galvanized**] [**stainless**]-steel, continuous-thread, 1/2-inch rods.

Horizontal Member: Adjustable horizontal, [**galvanized**] [**stainless**]-steel pipe support channels.

Pipe Supports: [**Roller**] [**Strut clamps**] [**Clevis hanger**] [**Swivel hanger**].

Hardware: [**Galvanized**] [**Stainless**] steel.

Accessories: Protection pads.

Height: [**12 inches above roof**] <**Insert lesser dimension above roof**>.

* + - * 1. High-Profile, Single-Base, Single-Pipe Stand:

Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

Base: Single vulcanized rubber or molded polypropylene.

Vertical Members: Two [**galvanized**] [**stainless**]-steel, continuous-thread, 1/2-inch rods.

Horizontal Member: One adjustable-height, [**galvanized-**] [**or**] [**stainless**]-steel, pipe-support slotted channel or plate.

Pipe Supports: [**Roller**] [**Clevis hanger**] [**Swivel hanger**].

Hardware: [**Galvanized**] [**Stainless**] steel.

Retain first or second option in "Accessories" subparagraph below if retaining "Clevis hanger" or "Swivel hanger" option in "Pipe Supports" subparagraph above.

Accessories: Protection pads[**, 1/2-inch, continuous-thread, galvanized-steel rod**] [**, 1/2-inch, continuous-thread, stainless-steel rod**].

Height: [**36 inches above roof**] <**Insert lesser dimension above roof**>.

* + - * 1. High-Profile, Multiple-Pipe Stand:

Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

Bases: Two or more; [**vulcanized rubber**] [**molded polypropylene**] <**Insert material**>.

Vertical Members: Two or more, [**galvanized**] [**stainless**]-steel channels.

Horizontal Members: One or more, adjustable-height, [**galvanized**] [**stainless**]-steel pipe support.

Pipe Supports: [**Roller**] [**Strut clamps**] [**Clevis hanger**] [**Swivel hanger**].

Hardware: [**Galvanized**] [**Stainless**] steel.

Retain option in "Accessories" subparagraph below if retaining "Clevis hanger" or "Swivel hanger" option in "Pipe Supports" subparagraph above.

Accessories: Protection pads[**, 1/2-inch, continuous-thread rod**].

Height: [**36 inches above roof**] <**Insert lesser dimension above roof**>.

* + - * 1. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.
			1. PIPE-POSITIONING SYSTEMS
				1. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.
			2. EQUIPMENT SUPPORTS

Equipment support in "Description" paragraph below requires calculating and detailing at each use.

* + - * 1. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.
			1. MATERIALS
				1. Aluminum: ASTM B221 “Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes”.
				2. Carbon Steel: ASTM A1011 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.
				3. Structural Steel: ASTM A36 “Standard Specification for Carbon Structural Steel” carbon-steel plates, shapes, and bars; black and galvanized.
				4. Stainless Steel: ASTM A240 “Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications”.
				5. Grout: ASTM C1107 “Standard Specification for Packaged Dry, Hydraulic-Cement Grout”, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

Properties: Nonstaining, noncorrosive, and nongaseous.

Design Mix: 5000-psi, 28-day compressive strength.

1. EXECUTION
	* + 1. APPLICATION
				1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
				2. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus [**200 lb**] <**Insert value**>.
			2. HANGER AND SUPPORT INSTALLATION
				1. Metal Pipe-Hanger Installation: Comply with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

Trapeze pipe hanger in "Metal Trapeze Pipe-Hanger Installation" paragraph below requires calculating and detailing at each use.

* + - * 1. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

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

Field fabricate from ASTM A36 “Standard Specification for Carbon Structural Steel” carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1 “Structural Welding Code – Steel”.

* + - * 1. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”. Install hangers and attachments as required to properly support piping from building structure.

Framing system in first paragraph below requires calculating and detailing at each use.

* + - * 1. [**Metal**] [**Fiberglass**]Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
				2. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
				3. Fastener System Installation:

Verify suitability of fasteners in two subparagraphs below for use in lightweight concrete or concrete slabs less than 4 inches thick.

Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

Pipe stand in "Pipe Stand Installation" paragraph below requires calculating and detailing at each use.

* + - * 1. Pipe Stand Installation:

Pipe Stand Types, except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

* + - * 1. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
				2. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

Equipment support in "Equipment Support Installation" paragraph below requires calculating and detailing at each use.

* + - * 1. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
				2. Install hangers and supports to allow controlled thermal and seismic 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.
				3. Install lateral bracing with pipe hangers and supports to prevent swaying.
				4. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, [**2-1/2 inch**] <**Insert size**> and larger 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.
				5. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
				6. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 “Building Services Piping” for building services piping.
				7. Insulated Piping:

Specify parts in first three subparagraphs below as galvanized or painted, as required. Other materials are available in place of wooden blocks.

Attach clamps and spacers to piping.

Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.

Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.

Do not exceed pipe stress limits allowed by ASME B31.9 “Building Services Piping” for building services piping.

Install MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe 4 inch and larger if pipe is installed on rollers.

High-compressive-strength inserts may permit use of shorter shields or shields with less arc span. Revise first subparagraph below to suit Project.

Install MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe 4 inch and larger if pipe is installed on rollers.

Shield Dimensions for Pipe: Not less than the following:

1/4 inch to 3-1/2 inch: 12 inches long and 0.048 inch thick.

4 inch: 12 inches long and 0.06 inch thick.

5 inch and 6 inch: 18 inches long and 0.06 inch thick.

8 inch to 14 inch: 24 inches long and 0.075 inch thick.

16 inch to 24 inch: 24 inches long and 0.105 inch thick.

Pipes 8 inch and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

* + - 1. EQUIPMENT SUPPORTS
				1. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
				2. Grouting: Place grout under supports for equipment and make bearing surface smooth.
				3. Provide lateral bracing, to prevent swaying, for equipment supports.
			2. METAL FABRICATIONS
				1. Cut, drill, and fit miscellaneous metal fabrications for [**trapeze pipe hangers**] [**and**] [**equipment supports**].
				2. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
				3. Field Welding: Comply with AWS D1.1 “Structural Welding Code – Steel” procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove welding flux immediately.

Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

* + - 1. ADJUSTING
				1. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
				2. Trim excess length of continuous-thread hanger and support rods to [**1-1/2 inches**] <**Insert dimension**>.
			2. PAINTING

Retain first "Touchup" paragraph below if Section 099114 "Exterior Painting" or Section 099123 "Interior Painting" is not in Project Manual.

* + - * 1. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

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

Retain "Touchup" paragraph below if Section 099114 "Exterior Painting" or Section 099123 "Interior Painting" is in Project Manual. Revise reference if Section 099600 "High-Performance Coatings" applies instead.

* + - * 1. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in [**Section 099114 "Exterior Painting."**] [**Section 099123 "Interior Painting."**] [**Section 099600 "High-Performance Coatings."**]
				2. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”.
			1. HANGER AND SUPPORT SCHEDULE
				1. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
				2. Comply with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation” for pipe-hanger selections and applications that are not specified in piping system Sections.
				3. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.
				4. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
				5. Use carbon-steel [**pipe hangers and supports**] [**metal trapeze pipe hangers**] [**and**] [**metal framing systems**] and attachments for general service applications.
				6. Use [**stainless-steel pipe hangers**] [**and**] [**fiberglass pipe hangers**] [**and**] [**fiberglass strut systems**] and [**stainless-steel**] [**or**] [**corrosion-resistant**] attachments for hostile environment applications.
				7. Use copper-plated pipe hangers and [**copper**] [**or**] [**stainless-steel**] attachments for copper piping and tubing.
				8. Use padded hangers for piping that is subject to scratching.
				9. Use thermal hanger-shield inserts for insulated piping and tubing.
				10. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes 1/2 inch to 30 inch.

Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes 4 inch to 24 inch, requiring up to 4 inches of insulation.

Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes 3/4 inch to 36 inch , requiring clamp flexibility and up to 4 inches of insulation.

Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes 1/2 inch to 24 inch if little or no insulation is required.

Pipe Hangers (MSS Type 5): For suspension of pipes 1/2 inch to 4 inch, to allow off-center closure for hanger installation before pipe erection.

Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes 3/4 inch to 8 inch.

Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes 1/2 inch to 8 inch.

Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes 1/2 inch to 8 inch.

Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes 1/2 inch to 8 inch.

Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes 3/8 inch to 8 inch.

Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes 3/8 inch to 3 inch.

U-Bolts (MSS Type 24): For support of heavy pipes 1/2 inch to 30 inch.

Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

Pipe Saddle Supports (MSS Type 36): For support of pipes 4 inch to 36 inch , with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

Pipe Stanchion Saddles (MSS Type 37): For support of pipes 4 inch to 36 inch , with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes 2-1/2 inch to 36 inch if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

Single-Pipe Rolls (MSS Type 41): For suspension of pipes 1 inch to 30 inch, from two rods if longitudinal movement caused by expansion and contraction occurs.

Adjustable Roller Hangers (MSS Type 43): For suspension of pipes 2-1/2 inch to 24 inch, from single rod if horizontal movement caused by expansion and contraction occurs.

Complete Pipe Rolls (MSS Type 44): For support of pipes 2 inch to 42 inch if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.

Pipe Roll and Plate Units (MSS Type 45): For support of pipes 2 inch to 24 inch if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.

Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes 2 inch to 30 inch if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

* + - * 1. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers 3/4 inch to 24 inch.

Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers 3/4 inch to 24 inch if longer ends are required for riser clamps.

* + - * 1. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.

Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.

Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

* + - * 1. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

C-Clamps (MSS Type 23): For structural shapes.

Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

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:

Light (MSS Type 31): 750 lb.

Medium (MSS Type 32): 1500 lb.

Heavy (MSS Type 33): 3000 lb.

Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

* + - * 1. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

Thermal Hanger-Shield Inserts: For supporting insulated pipe.

* + - * 1. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.

Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

Horizontal (MSS Type 54): Mounted horizontally.

Vertical (MSS Type 55): Mounted vertically.

Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

* + - * 1. Comply with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation” for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
				2. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Verify suitability of fasteners in this article for use in lightweight concrete or concrete slabs less than 4 inches thick. Powder-actuated fasteners may be banned for use in certain occupancies. Consult authorities having jurisdiction and the Owner's project requirements.

* + - * 1. Use [**powder-actuated fasteners**] [**or**] [**mechanical-expansion anchors**] instead of building attachments where required in concrete construction.
				2. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529