This master should be used by designers working on Port of Portland construction projects and by designers working for PDX tenants (“Tenants”). Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

This section specifies supports and anchors for non-vibration isolated equipment, tanks, and piping systems. If this section is used, always include Section 220545, Seismic Restraints for Plumbing Piping and Equipment. If equipment requiring vibration isolation is specified, include Section 220548, Vibration and Seismic Controls for Plumbing Piping and Equipment.

SECTION 220529 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1. GENERAL
	* + 1. DESCRIPTION
				1. This section describes the following:

Hangers, supports, and anchors for plumbing equipment, tanks, and piping systems.

Supplementary steel for support or attachment of plumbing tanks, equipment, and piping to general construction elements of the project.

* + - 1. RELATED WORK SPECIFIED ELSEWHERE
				1. Section 220545, Seismic Restraints for Plumbing Piping and Equipment
			2. REFERENCES
				1. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASHRAE Chapter 41: Absorption, Cooling, Heating, and Refrigeration Equipment

* + - * 1. CISPI: Cast Iron Soil Pipe Institute
				2. IBC: International Building Code
				3. OSPSC: Oregon State Plumbing Specialty Code
				4. UMC: Uniform Mechanical Code
			1. SUBMITTALS
				1. Product Data: Submit product data for products specified herein.
				2. Shop Drawings:

Submit shop drawings of Contractor-fabricated piping support structures, pipe racks, and anchors.

Suspended Piping: Submit shop drawings of piping indicating point loads and support locations, along with applicable details keyed to layouts.

Support Frames, Piping, Tank, and Equipment Supports, and Anchorage: Submit shop drawings indicating point loads and support locations, along with engineers’ calculations and details keyed to the layouts pertaining to supports, support frames, and anchorages.

Supplementary Steel: Submit shop drawings showing details of fabrication and installation. Indicate materials, thicknesses, gauges, sizes, dimensions, methods of joining and fastening, welds, finishes, details of reinforcement and embedment, attachments, anchorages, miscellaneous metal items incidental to basic fabrication shown, provisions for work of other trades, and other pertinent information. Submit structural calculations for necessary supplementary steel for supports, anchors, and attachment of equipment, and pipes to general construction. Calculations shall be prepared and stamped by a registered professional structural engineer licensed in the state of Oregon.

As-Constructed Drawings and Data: Submit as-constructed data and as-constructed drawings.

1. PRODUCTS
	* + 1. SUPPORTS AND ANCHORAGE
				1. Provide pipe and equipment hangers and supports in accordance with the following:

When supports and anchorages for tanks, equipment, conduit, and piping are not shown on the drawings, the Contractor shall be responsible for their design.

Supports and anchorages shall resist forces due to hydraulic testing and seismic forces as specified in the IBC for the ground motion accelerations corresponding to the project location.

Supports and anchorages shall not introduce stresses in the piping caused by thermal expansion or contraction.

Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

* + - * 1. The following engineered support systems shall be designed, detailed, and bear the seal of a registered professional structural engineer licensed in the state of Oregon:

Supports, floor and roof-mounted tanks, and supports for suspended tanks and equipment.

Support frames, such as pipe racks or stanchions, for piping and equipment which provide support from below.

Tank, equipment and piping support frame anchorage to supporting slab or structure.

* + - 1. SUPPORTS, GENERAL
				1. Acceptable Manufacturers: B-Line Systems, Anvil, Powerstrut and Kinline, Superstrut, Unistrut, or equal.
				2. Fabricate support members from welded standard structural shapes, pipe, and plate. Carry the necessary rollers, hangers, and accessories as required. Piping less than 4-inch pipe size may be supported from or by prefabricated roll-formed channels as specified in this section with necessary accessories to adequately support piping system.
				3. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
				4. Dissimilar Metal Protection: Cush-a-Strip, Hydra-Zorb cushions, or equal.
			2. PIPE ATTACHMENTS
				1. Acceptable Manufacturers: B-Line Systems, Elcen, Anvil, Michigan Hanger, Superstrut, Tolco, or equal.
				2. Clamps: Superstrut Series 700 through 702.
				3. Insulated Horizontal Steel Piping:

Hot and Cold Water, 2 Inches and Under: Anvil 65 with Fig. 167 shield.

Cold Water, Over 2 Inches: Anvil Fig. 260 with Fig. 167 shield.

Other, 2 Inches and Under: Anvil Fig. 65 with Fig. 167 shield.

Other, Over 2 Inches: Anvil Fig. 260 with Fig. 167 shield.

* + - * 1. Uninsulated Horizontal Steel Piping:

2 Inches and Under: Anvil Fig. 65.

Over 2 Inches: Anvil Fig. 260.

* + - * 1. Insulated Horizontal Copper Piping:

Hot and Cold Water, 2 Inches and Under: Anvil Fig. 65 with Fig. 167 shield.

Hot and Cold Water, Over 2 Inches: Anvil 260 with Fig. 167 shield.

* + - * 1. Uninsulated Horizontal Copper Piping:

2 Inches and Under: Anvil Fig. CT65 or CT69.

Over 2 Inches: Anvil Fig. CT65.

* + - * 1. Horizontal Cast Iron Pipe: Anvil Fig. 260.
				2. Riser Clamps, Steel and Cast Iron Pipe: 3/4-inch to 20-inch, Anvil Fig. 261.
				3. Riser Clamps, Copper Pipe: Anvil Fig. CT-121.
			1. PIPE ROLLERS
				1. Supported: Anvil Fig. 274, pipe roll chair, adjustable; or equivalent product by B‑Line Systems, Elcen, Superstrut, Tolco, or equal.
				2. Supported: Superstrut C728H, pipe roller, aluminum wheels, and steel brackets, or equivalent product by B-Line systems, Elcan, Anvil, Tolco, or equal.
				3. Suspended: Anvil Fig. 171 or Fig. 177 adjustable pipe roller; or equivalent product by B-Line Systems, Elcen, Superstrut, Tolco, or equal.
			2. PIPE RACKS
				1. Acceptable Manufacturers: Kin-Line, Superstrut, Uni-Strut, or equal.
				2. Supports and Accessories: Preformed roll-formed channels and accessories with electrochromate or equal finish and matching compatible accessories as shown, as specified, and as required.
			3. PROTECTION SHIELDS
				1. Select protection shields based on actual outside diameter of pipe plus insulation. Use protection shields at hanger or roller assemblies on cold water piping, where hangers are installed around insulation, and on both sides of clamps or U-bolts where installed around insulations. Use Anvil Fig. 167 or equal.
			4. BUILDING ATTACHMENTS
				1. Acceptable Manufacturers: B-Line Systems, Elcen, Anvil, Superstrut, Tolco, or equal.
				2. Beam Hangers:

Beam Clamps: Anvil Fig. 218, adjustable malleable iron beam clamp, or Fig. 292, adjustable forged steel beam clamp.

C-Type Clamps: Anvil Fig. 93. Sized for required rod to support load being carried.

Welded: Anvil Fig. 66. Sized for required rod to support load being carried.

* + - * 1. Inserts:

Malleable iron or steel inserts, Superstrut M-732CB or S. Inserts sized for required rod to support load being carried.

Malleable iron or steel inserts, Grinnell, Fig. 152. Inserts sized for required rod to support load being carried.

* + - * 1. Expansion Plugs: Similar and equal to Phillips “red-head” self-drilling flush shell, selected for safety factor of 4.
			1. PIPE ANCHORS
				1. Fabricate from steel plate as detailed (hot water).
1. EXECUTION
	* + 1. HANGERS AND SUPPORTS
				1. General:

Install all support systems as detailed and in accordance with manufacturer’s recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the drawings.

Provide adjustable hangers complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., for all pipes, except where specified otherwise.

Size hangers to clear insulation for piping services conveying liquids less than 70ºF.

Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods. Do not use tape for isolation.

Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

Install cast iron piping in accordance with CISPI standards.

Install piping systems in accordance with OSPSC standards.

* + - * 1. Vertical Piping:

Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved by the Port.

Riser clamps shall be directly under fitting or welded to pipe.

Risers shall be supported at each floor of penetration.

Provide structural steel supports at the base of pipe risers. Size supports to carry all forces exerted by piping system when systems are in operation.

* + - * 1. Horizontal Piping:

On all insulated piping, provide insulation protection shields at all roller locations.

Cold and Hot Piping Systems:

Install hangers outside of insulation.

On piping 1-1/2-inch and larger, provide insulation protection shields at each hanger location.

* + - * 1. Trapeze Hangers: Multiple pipe runs where indicated shall be supported on channels with rust resistant finish. Provide all necessary supporting steel.

Channels: Unistrut with electro-chromate finish, or equal.

* + - * 1. Hanger Spacing: Provide hangers at minimum spacing in accordance with Chapter 41ASHRAE Guide and as follows:

Steel Pipe, Copper Tubing: For straight runs of horizontal piping with no concentrated loads such as valves, flanges, expansion joints, or other components. Sections of piping with concentrated loads shall be considered carefully and installed with appropriate spacing and rod size for the given situation.

|  |  |  |  |
| --- | --- | --- | --- |
| Pipe Size | Max. SpanSteel | Max. SpanCopper | Rod Size |
| 1" and smaller | 7 feet | 5 feet | 3/8" |
| 1-1/4" to 2" | 8 feet | 8 feet | 3/8" |
| 2-1/2" to 3" | 11 feet | 9 feet | 1/2" |
| 4" to 5" | 14 feet | 10 feet | 1/2" |
| 6" | 17 feet | 12 feet | 5/8" |
| 8" or larger | 19 feet | 14 feet | 7/8" |

Service: Domestic cold water, hot water, recirculating hot water, non-portable water, and other pressurized systems.

* + - * 1. Fuel Gas Piping: Support in accordance with UMC requirements.
				2. Plumbing Piping: For plumbing piping not specified above, support in accordance with OSPSC requirements.
				3. Insulation Protection:

Where piping is suspended from insulation, provide 16-gauge galvanized steel protection shields, 12 inches long and under piping insulation at all points of suspension.

Band shields firmly to insulation to prevent slippage.

* + - * 1. Building Attachments:

Where possible, support all piping and equipment from structural members, beams, and joists.

Provide structural steel angles, channels, or other members to support piping and equipment where structural members do not occur as required for proper support.

Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points or provide web reinforcing as required.

Provide transverse and longitudinal bracing on piping at 75-foot intervals, 40‑foot intervals for domestic cold water, and to provide a stabilized piping system. Bracing shall not introduce stresses in the piping system caused by thermal expansion or contraction.

Do not fasten or attach to unfilled steel roof deck structure.

Attach to concrete-filled steel floor deck structure for loads up to 400 pounds. Loads larger than 400 pounds shall be designed per code. Submit structural calculations stamped and signed by a structural engineer licensed in the State of Oregon showing that the concrete-filled floor deck has sufficient capacity to support the load at the points of anchorage.

* + - * 1. Pipe Racks:

General: Provide racks as shown with additional elements to adequately support piping.

Coordination: Where mechanical piping, tubing, etc., and electrical conduit, wiremold, wireways, etc., follow common routings, coordinate routing. Allow sufficient clearance to adequately operate, access, and maintain all devices without dismantling racks.

* + - * 1. General: Support all piping within 2 feet of change of direction on both sides of fitting.

END OF SECTION 220529