

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 23 05 00 - Common Work Results for HVAC
- .2    Section 23 05 05 - Installation of Pipework

**1.2                REFERENCES**

- .1    American Society of Mechanical Engineers (ASME)
  - .1    ASME B31.1, Power Piping.
- .2    ASTM International
  - .1    ASTM A125, Standard Specification for Steel Springs, Helical, Heat-Treated.
  - .2    ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3    ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts.
- .3    Canadian Standards Association (CSA)/CSA International.
  - .1    CAN/CSA B139-09, Code d'installation des appareils de combustion au mazout.
  - .2    CAN/CSA B149.1-10, Code d'installation de gaz naturel et du propane.
- .4    Factory Mutual (FM)
- .5    Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1    MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2    MSS SP69, Pipe Hangers and Supports - Selection and Application.
  - .3    MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .6    National Fire Protection Association (NFPA).
  - .1    NFPA 13-2013, Installation of Sprinklers Systems.
  - .2    NFPA 14-2013, Installation of Standpipe Systems.
- .7    Underwriter's Laboratories of Canada (ULC)

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in of Canada and member of the OIQ.
- .2 Submit shop drawings for:
  - .1 Bases, hangers and supports.
  - .2 Connections to equipment and structure.
  - .3 Structural assemblies.
- .4 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturers' Instructions:
  - .1 Provide manufacturer's installation instructions.
    - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

### **Part 2 Products**

#### **2.1 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
  - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
  - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
  - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
  - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

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## 2.2 GENERAL

- .1 Items covered by this section to hang and support pipes and equipment only. They must not be used to lift or mount other items or devices.

## 2.3 ANCHORING

- .1 Upper structural attachment: suspension from lower flange of I-Beam:
  - .1 Piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut, and carbon steel retaining clip, UL and ULC listed, FM approved, to MSS-SP69.
  - .2 Piping NPS 2½ or greater: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts, and washers, UL and ULC listed, FM approved, to MSS-SP69.
- .2 Upper structural attachment: suspension from upper flange of I-Beam:
  - .1 Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL and ULC listed, FM approved, to MSS SP69.
  - .2 Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer, and nut, UL listed, FM approved, to MSS SP69.
- .3 Steel truss:
  - .1 Piping NPS 2½ maximum: supporting steel plates with two locknuts.
  - .2 Piping NPS 2½ or greater supporting steel plates with two locknuts, carbon steel weldable bracket, and malleable iron eye nut.
  - .3 Carbon steel weldable bracket with two locknuts, to MSS-SP-69, type 22.
- .4 Steel section or angle beam (lower flange):
  - .1 Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL and ULC listed, FM approved, to MSS SP69.
- .5 Steel section or angle beam (upper flange):
  - .1 Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut, UL listed, FM approved, to MSS SP69.
- .6 Wood works :
  - .1 Malleable iron ceiling flange.
- .7 Upper attachment to concrete:
  - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin, and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
  - .2 Concrete recessed brackets, corner, and protection plate with breakable insert, UL and ULC listed, FM approved and to MSS-SP-69.
- .8 Hanger rods: threaded rod material to MSS SP58:

- .1 Ensure that hanger rods are subject to tensile loading only.
- .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .9 Supports installed over insulation:
  - .1 Steel or copper piping, longitudinal movement less than 25 mm: adjustable clevis, to MSS-SP-69, UL and ULC listed, FM approved.
  - .2 Steel piping, longitudinal movement of more than 25 mm: yoke style pipe roll to MSS-SP-69, type 43.
  - .3 Hot steel or copper piping supported below: pipe roller to MSS-SP-69, type 44.
- .10 Pipe attachments installed directly on the pipe:
  - .1 Steel piping, longitudinal movement less than 25 mm: adjustable clevis, to MSS-SP-69, type 10, UL listed and FM approved.
  - .2 Copper piping, longitudinal movement less than 25 mm: copper adjustable clevis, to MSS-SP-69, type 10.
  - .3 Steel piping, longitudinal movement of more than 25 mm: yoke style pipe roll to MSS-SP-69, type 43.
  - .4 Steel piping supported below: pipe roller to MSS-SP-69, type 44.
  - .5 Ductile iron vent and drainage piping, steel mechanical joints, adjustable double hook-type on both sides of the joint (for NPS 2 to NPS 6), and ductile iron shield (for NPS 8 and NPS 10).
- .11 Fire protection pipe attachments:
  - .1 Steel fire protection piping: adjustable clevis, to MSS-SP-69, type 10, UL listed and FM approved.
- .12 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end, to ASTM A563.
  - .1 Finishes for galvanized steel pipework.
  - .2 Finishes for copper, glass, brass, or aluminum pipework: black with plastic coated formed portion.

## **2.4 PIPE HANGERS**

- .1 Fix to structural elements. If no structural elements are available, fix hangers to channels or steel angles. Provide and install additional structural elements. Permission is required to use vertical expansion bolts. Use at least two bolts per hanger or support. Do not suspend from steel deck. Fix pipes and equipment according to manufacturer's recommendations.
- .2 Use adjustable hanger rings for all pipe sizes.
- .3 Use roller supports where specified. Acceptable Product: Myatt, Anvil, Apex.
  - .1 Piping service temperature over 95 ° C (200 ° F); Anvil 181 and 271.
  - .2 Copper piping : (not thermally insulated) domestic water, drains, vents and others : Anvil CT 65, CT 121.

- .3 All other services: Anvil 65 to 50 mm (2 ") and 260 mm for 65 mm (2½") or more and 261 for risers.
- .4 Use braced roller supports in the following cases: when hangers cannot be fixed to the upper part of a structural steel frame.
- .5 Suspension rod minimum length of 150 mm (6") for entire piping.
- .6 Mild steel rods with sufficient machined thread length to adjust pipe levels.
- .4 Grouped pipe hangers made of galvanized steel structural steel shapes I, U or H, angles or prefabricated profiles. Welds are continuous and free of clumps. These hangers are fixed to the structure with Phillips Red Head anchors or approved equivalent (for painting see Section 20 05 00).
- .5 Spacing between grouped pipe hangers to be determined based on the smallest pipe size.
- .6 With the following exceptions, refer to the table below for rod diameters and hanger spacings:
  - .1 Support sanitary piping according to the Canadian Plumbing Code and/or as specified.
  - .2 Support sprinkler systems piping according to NFPA 13.
  - .3 Support standpipe systems piping according to NFPA 14.
  - .4 Install hanger at every 1.8m (6') for gas pipes with nominal pipe size NPS 12 mm (½").
  - .5 Install hanger at every 1,5 m (5') for copper tubes nominal pipe size NPS 12 mm (½").
  - .6 Support plastic and glass pipes according to Manufacturer's recommendations.

Pipe size		Rod Diameter	Maximum spacing	
(Nominal Pipe Size)			Steel	Copper
NPS 20, 25	(¾", 1")	10 mm (⅜")	2,1 m (7')	1,8 m (6')
NPS 32	(1¼")	10 mm (⅜")	2,1 m (7')	1,8 m (6')
NPS 40	(1½")	10 mm (⅜")	2,7 m (9')	2,4 m (8')
NPS 50	(2")	10 mm (⅜")	3 m (10')	2,7 m (9')
NPS 65, 75	(2½", 3")	10 mm (⅜")	3,6 m (12')	3 m (10')
NPS 100	(4")	16 mm (⅝")	4,2 m (14')	3,6 m (12')
NPS 125	(5")	16 mm (⅝")	4,8 m (16')	
NPS 150	(6")	22 mm (⅞")	5,1 m (17')	
NPS 200	(8")	22 mm (⅞")	5,7 m (19')	
NPS 250	(10")	22 mm (⅞")	6,6 m (22')	
NPS 300	(12")	22 mm (⅞")	6,9 m (23')	

- .7 Install supports within 300 mm (12") of each horizontal elbow.
- .8 All supports must include the following: anchor bolts, suspension rods, collars and hangers.

- .9 Where the temperature of the transported medium is of 18 °C (64 °F) or less, except for domestic cold water, install hangers or supports over the insulation with prefabricated insulation protection shields.
  - .1 Acceptable products: Anvil no 167, Myatt, Apex or a replacement product approved by addendum in accordance with the Instructions to Bidders.
- .10 Where the temperature of the transported medium is 110 °C (231 °F) or more, install hangers or supports over the insulation with prefabricated insulation protection shields.
  - .1 Acceptable products: Anvil 160 to 165, Myatt, Apex or a replacement product approved by addendum in accordance with the Instructions to Bidders.
- .11 Ring hangers installed with offset such that rod is vertical when piping reaches operating temperature.
- .12 Adjust rod suspension heights to distribute loads equally.
- .13 Prior to manufacture or installation submit shop drawings of all types of supports for approval.
- .14 On roofs, use prefabricated supports with a high density polypropylene base and ultraviolet protection.
  - .1 Acceptable Products: Portable Pipe Hangers PP and SS series, Advanced Support Products inc. SS1000 series or replacement product approved by addendum in accordance with the Instructions to Bidders.
- .15 Finishes
  - .1 Pipe hangers and supports galvanized after manufacture.
  - .2 Use electro-plating galvanizing process.
  - .3 Steel hangers in contact with copper piping to be copper plated or epoxy coated.

## **2.5 RISER CLAMPS**

- .1 Steel or cast iron pipe: black carbon steel according to MSS SP58, type 42, UL listed.
- .2 Copper pipe: copper plated carbon steel according to MSS SP58, type 42.
- .3 Bolts: according to ASTM A307.
- .4 Nuts: according to ASTM A563.

## **2.6 INSULATION PROTECTION SHIELDS**

- .1 Insulated cold piping:
  - .1 64 kg/m<sup>3</sup> density insulation plus insulation protection shield to comply with MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
  - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel, to comply with MSS SP69.

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## **2.7 CONSTANT SUPPORT SPRING HANGERS**

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustments without special tools. Adjustments not to affect spring travel capacity.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

## **2.8 VARIABLE SUPPORT SPRING HANGERS**

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops..
- .4 Steel alloy springs: comply with ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

## **2.9 EQUIPMENT SUPPORTS**

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings. Submit calculations with shop drawings.

## **2.10 EQUIPMENT ANCHOR BOLTS AND TEMPLATES**

- .1 Provide templates to ensure accurate location of anchor bolts.

## **2.11 HOUSE-KEEPING PADS**

- .1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.
- .2 Concrete: according to Section 03 30 00 - Cast-in-Place Concrete.

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**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2 INSTALLATION**

- .1 Install in accordance with:
  - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
  - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clamps on riser piping:
  - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
  - .2 Bolt-tightening torques to industry standards.
  - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
  - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
  - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
  - .1 Vertical movement of pipework is 13 mm or more,
  - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
  - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
  - .2 Variation in supporting effect does not exceed 25 % of total load.

**3.3 HANGER SPACING**

- .1 Plumbing piping: to National Plumbing Code. Provincial Code.
- .2 Sprinkler piping: hanger spacing according to NFPA 13.
- .3 Standpipes: hanger spacing according to NFPA 14
- .4 Follow CAN/CSA B139 Code Requirements for fuel piping.
- .5 Follow CAN/CSA B149.01 Code Requirements for natural gas piping.
- .6 Copper piping up to NPS 1/2: every 1.5 m.

- .7 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

### **3.4 HANGER INSTALLATION**

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

### **3.5 HORIZONTAL MOVEMENT**

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

### **3.6 FINAL ADJUSTMENT**

- .1 Adjust hangers and supports:
  - .1 Ensure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- .2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

### **3.7 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.8 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**