|  |  |  |
| --- | --- | --- |
| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 16, 2009 | Modified ‘Related Sections’ |
| 3 | March 15, 2011 | Minor changes from Legal |
| 4 | August 18, 2014 | First draft review comments (AV) |
| 5 | June 8, 2015 | Second Draft for Review (AV) |
| **6** | **September 16, 2015** | **Updated, Finalized Specification – Reference eDOCS #5823676-v4 (AV)** |
| 7 | May 25, 2017 | Updated references to standards ASTM A123/A123M-15, ASTM A653/A653M-15e1, National Building Code of Canada 2015 **(AAM)** |
| 8 | August 16, 2017 | Removal of listed products and replaced them with performance specifications and standards (CPD, OMM) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GENERAL

## Related Sections

### *[Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.*

### *Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.*

### *Contractor is responsible for coordination of the Work.*

### *This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]*

### *[List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]*

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### *[List Sections specifying products installed but not supplied under this Section and indicate specific items.]*

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### *[List Sections specifying related requirements.]*

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

#### Section 01300 – Submittals

#### Section 05500 – Metal Fabrications General

#### Section 09900 – Painting and Protective Coatings

## References

*[Delete .1 if Section 01060 – Regulatory Requirements is included in Contract Documents.]*

### Comply with the latest edition of the following statutes, codes, standards, and all amendments thereto:

#### American Society for Testing and Materials (ASTM):

##### ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

##### ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

#### National Building Code of Canada 2015 (NBC)

#### Ontario Building Code (OBC)

###### Building Code Act, 1992, Ontario Regulation 332/12 – Building Code

#### Manufacturers’ Standardization Society (MSS):

##### MSS SP-58-2009, Pipe Hangers and Supports - Materials, Design, Selection, Application, and Installation.

##### MSS SP 69, Pipe Hangers and Supports – Selection and Application

## Definitions

### Wetted or Submerged: Submerged, less than 0.3m above liquid surface, below top of channel wall, under cover or slab of channel or tank, or in other damp locations.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

*If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.]*

## Submittals

### Shop Drawings, in accordance with Section 01300 - Submittals:

#### Drawings of piping support system, locating each support, brace, hanger, guide, component, and anchor. Identify support, hanger, guide, and anchor type by catalogue number and shop drawing detail number.

#### Revisions to support systems (as approved by the Consultant) resulting from changes in related piping system layout or addition of flexible joints.

### Information Submittals, in accordance with Section 01300 - Submittals: Maintenance information on piping support system.

## Qualifications

### Piping support systems shall be designed and shop drawings prepared and sealed by a registered professional engineer licensed to practice in the Province of Ontario.

## Design Requirements

### General:

#### Seismic Load: Seismic performance category forces with seismic loads in accordance with Building Code Act, 1992, Ontario Regulation 332/12 – Building Code.

#### Design, size, and locate piping support systems throughout the facility, whether shown or not on the Contract Drawings.

#### Piping Smaller than 750 mm: Supports are shown only where specific types and locations are required; additional pipe supports may be required.

#### Piping 750 mm in diameter and Larger: Support systems have been designed for piping shown.

#### Meet requirements of MSS SP-58-2009 or as modified by this Section. *[Consultant to modify as required]*

### Pipe Support Systems:

#### Load: Dead loads imposed by weight of pipes filled with water, except air and gas pipes, plus insulation.

#### Maximum Support Spacing and Minimum Rod Size:

##### Mild Steel or Ductile Iron Piping (Note that this spacing may require the use of higher load pipe clamps and more than a single point anchor point in concrete).

|  |  |  |
| --- | --- | --- |
| Pipe Size  Diameter | Maximum Support/ Hanger Spacing | Minimum Rod Size Single Rod Hangers |
| 25 mm & smaller | 1.8 m | 6.25 mm |
| 32.5 mm through  62.5 mm | 2.4 m | 6.25 mm |
| 75 mm & 100 mm | 3.0 m | 9.5 mm |
| 150 mm | 3.6 m | 9.5 mm |
| 200 mm | 3.6 m | 12.5 mm |
| 250 mm & 300mm | 4.3 m | 15.9 mm |
| 350 mm | 4.8 m | 19.1 mm |
| 400 mm & 450 mm | 4.8 m | 22.2 mm |
| 500 mm | 5.4 m | 25.4 mm |
| 600 mm | 5.4 m | 31.7 mm |
| 762 mm & larger | As shown on the Drawings | As shown on the Drawings |

##### Copper Piping: Maximum Support Spacing: 0.61 m less per size than listed for steel pipe, with 25 mm and smaller pipe supported every 1.5 m. Minimum Hanger Rod Sizing: Same as listed for steel pipe.

##### Plastic and Fibreglass Piping: Maximum support spacing: As recommended by the manufacturer for flow temperature in pipe. Minimum Hanger Rod Sizing: Same as listed for steel pipe.

##### Stainless Steel Piping:

|  |  |  |
| --- | --- | --- |
| SST Pipe Size  Diameter | Maximum Support/ Hanger Spacing | Minimum Rod Size Single Rod Hangers |
| 25 mm through 100 mm | 2.4 m | 6.25 mm |
| 150 mm | 2.4 m | 9.5 mm |
| 200 mm & 250 mm | 3.0 m | 12.5 mm |
| 300 mm | 3.0 m | 12.5 mm |
| 350 mm& 400 mm | 3.6 m | 15.9 mm |
| 450 mm & 500 mm | 4.3 m | 19.1 mm |
| 600 mm | 4.3 m | 22.2 mm |

### Framing Support System:

#### Beams: Size such that beam stress does not exceed 172,000 kPa and maximum deflection does not exceed 1/240 of span.

#### Column Members: Size in accordance with the manufacturer’s recommended method.

#### Support Loads: Calculate using weight of pipes filled with fluid being conveyed at maximum spans between support system attachment points:

##### Steel and Ductile Iron Pipe, 75 mm in Diameter and Larger: 3 m centres, unless shown otherwise on the Drawings.

##### Other Pipelines and Special Situations: May require supplementary hangers and supports.

#### Electrical Conduit Support: Include in design of framing support system.

### 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.

### Vertical Sway Bracing: 3 m maximum centres, or as shown on the Drawings.

### Existing Support Systems: Use existing supports systems to support new piping only if the Contractor can show that they are adequate for additional load and approved by the Consultant, or if they are strengthened to support additional load.

# PRODUCTS

## General

### When specified items are not available, fabricate pipe supports of correct material and to general configuration indicated by catalogues.

### Special support and hanger details are shown for cases where standard catalogue supports are inapplicable.

### Materials: In accordance with Tables 1 and 2, attached as supplements to this Section.

## Hangers

### Clevis Type:

#### Made from carbon steel.

#### Maximum functioning temperature of at least [450˚C].

#### Underwriter's Laboratories Listed.

#### In accordance with MSS SP-69-2012 and MSS SP-58-2009

#### Type 1 or 6.

### Hinged Split Ring Pipe Clamp:

#### In accordance with MSS SP-69-2012, and MSS SP-58-2009.

#### Made from malleable iron or carbon steel.

#### Maximum functioning temperature of at least [450˚C].

#### Type 6 or 12.

### Hanger Rods, Clevises, Nuts, Sockets, and Turnbuckles: In accordance with MSS SP-58-2009 *[Consultant to confirm]*.

### Attachments:

#### I Beam Clamp: Concentric loading type, MSS SP-58-2009 , Type 21, 28, 29, or 30, which engage both sides of flange. *[Consultant to confirm]*

#### Concrete Insert: MSS SP-58-2009, Type 18, continuous channel insert with load rating not less than that of hanger rod it supports. *[Consultant to confirm]*

## Saddle Supports

### Pedestal Type: Schedule 40 pipe stanchion, saddle, and anchoring flange.

#### Nonadjustable Saddle:

##### In accordance with MSS SP-69-2012 and MSS SP-58-2009

##### Type 37 with U bolt

##### Made from [cast iron][ or ][steel]

#### Adjustable Saddle:

##### In accordance with MSS SP-69-2012

##### Made from [cast iron][ or ][carbon steel]

##### Type 38 without clamp

## Wall Brackets

### Welded Steel Bracket:

#### In accordance MSS SP-58-2009 and MSS SP-69-2012

#### Type 33 (heavy-duty)

#### Maximum load of at least: [13 kN]

### One Hole Clamp: Anvil; Figure TBA

### Channel Type:

#### Channel size: 12 gauge, 41 mm wide minimum steel, 31 mm wide, minimum FRP.

#### Members and connections: Design for all loads with safety factor of 5.

## Pipe Clamps

### Riser Clamp:

#### In accordance MSS SP-58-2009 and MSS SP-69-2012

#### Type 8

#### Material: steel.

#### Underwriter's Laboratories Listed.

## Channel Type Support Systems

### Channel Size: 12 gauge, 1 5/8 inch wide minimum steel, 1 1/2 inch wide, minimum FRP.

### Members and Connections: Design for all loads with safety factor of 5.

### Acceptable Manufacturers:

#### *[Consultant to provide three acceptable product names]*

#### Approved Equivalent.

## Accessories

### Insulation Shields:

#### Type: Galvanized steel or stainless steel, MSS SP-58-2009, Type 40.

#### Acceptable Manufacturers and Products:

##### *[Consultant to provide three acceptable product names].*

##### Approved Equivalent

### Welding Insulation Saddles:

#### Type: MSS SP-58-2009, Type 39.

#### Acceptable Manufacturers and Products:

##### *[Consultant to provide three acceptable product names].*

##### Approved Equivalent.

### Vibration Isolation Pads:

#### Type: Neoprene Waffle.

#### AcceptableManufacturers and Products:

##### *[Consultant to provide three acceptable product names].*

##### Approved Equivalent

### Flush Type Insert Channels: As specified in Section 05500 - Metal Fabrications General.

## Intermediate Pipe Guides

### Piping 150 mm in diameter and Smaller:

#### Type: Pipe clamp with oversized pipe sleeve to provide a minimum clearance of 3.2 mm.

#### Acceptable Manufacturers and Products:

##### *[Consultant to provide three acceptable product names.]*

##### Approved equivalent

### Piping 200 mm in diameter and Larger:

#### Type: Specially formed U bolts with double nuts shall provide a minimum clearance of 6.4 mm around pipe.

#### U Bolt Stock Size:

##### 200 mm Pipe: 15.9 mm.

##### 250 mm Pipe: 19.1 mm.

##### 300 mm through 400 mm Pipe: 22.2 mm.

##### 450 mm through 762 mm Pipe: 25.4 mm.

## Pipe Alignment Guides

### Type:

#### Piping 200 mm in diameter and Smaller: Spider or sleeve type.

#### Piping 250 mm in diameter and Larger: Roller type.

### Acceptable Manufacturers:

#### *[Consultant to provide three acceptable product names.]*

#### Approved Equivalent

## Pipe Anchors

### Type: Anchor chair with U bolt strap.

### Acceptable Manufacturers and Products:

#### *[Consultant to provide three acceptable product names.]*

#### Approved Equivalent

## Anchoring Systems

### Size: Sized by equipment manufacturer, and as specified in Section 05500 - Metal Fabrications General.

# EXECUTION

## Installation

### General:

#### Install support systems in accordance with MSS SP-58 and MSS SP 89, unless shown otherwise on the Drawings.

#### Support piping connections to equipment by pipe support and not by equipment.

#### Support large or heavy valves, fittings, and appurtenances independently of connected piping.

#### Support no pipe from pipe above it.

#### Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.

#### Do not install pipe supports and hangers in equipment access areas or bridge crane runs.

#### Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.

#### Install lateral supports for seismic loads at all changes in direction.

#### Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.

#### Repair mounting surfaces to their original pre-construction condition after attachments are made.

### Standard Pipe Supports:

#### Horizontal Suspended Piping:

##### Single Pipes: Adjustable swivel ring, split ring, or clevis hangers.

##### Grouped Pipes: Trapeze hanger systems.

##### Furnish galvanized steel protection shield and oversized hangers for insulated pipe.

##### Furnish precut sections of rigid insulation with vapour barrier at hangers for insulated pipe.

#### Horizontal Piping Supported From Walls:

##### Single Pipes: Wall brackets or wall clips attached to wall with anchors. Clips attached to wall mounted framing also acceptable.

##### Stacked Piping:

###### Wall mounted framing system and clips acceptable for piping smaller than 75 mm minimal diameter.

###### Piping clamps that resist axial movement of pipe through support not acceptable.

##### Wall mounted piping clips are not acceptable for insulated piping.

#### Horizontal Piping Supported From Floors:

##### Stanchion Type:

###### Pedestal type; adjustable with stanchion, saddle, and anchoring flange.

###### Use yoked saddles for piping whose centreline elevation is 450 mm or greater above the floor and for exterior installations.

###### Provide neoprene waffle isolation pad under anchoring flanges, adjacent to the equipment or where otherwise required to provide vibration isolation.

#### Floor Mounted Channel Supports:

##### Use for piping smaller than 75 mm nominal diameter running along floors and in trenches at piping elevations which are lower than those which can be accommodated using pedestal pipe supports.

##### Attach channel framing to floors with anchor bolts.

##### Attach pipe to channel with clips or pipe clamps.

#### Concrete Cradles: Use for piping larger than 75 mm along floor and in trenches at piping elevations which are lower than those which can be accommodated using stanchion type.

#### Vertical Pipe: Support with wall brackets and base elbow or riser clamps on floor penetrations.

#### Standard Attachments:

##### To Concrete Ceilings: Concrete inserts.

##### To Steel Beams: I beam clamp or welded attachments.

##### To Wooden Beams: Lag screws and angle clips to members shall not be less than 62.5 mm thick.

##### To Concrete Walls: Concrete inserts or brackets or clip angles with anchor bolts.

#### Existing Walls and Ceilings: Install as specified in the Contract Documents *[Consultant to ensure Contract Documents provide these details]* for new construction, unless shown otherwise on the Drawings.

### Intermediate and Pipe Alignment Guides:

#### Provide pipe alignment guides (or pipe supports that provide same function) at expansion joints and loops.

#### Guide piping on each side of expansion joint or loop at 4 and 14 pipe diameters from each joint or loop.

#### Install intermediate guides on metal framing support systems not carrying pipe anchor or alignment guide.

### Accessories:

#### Insulation Shield: Install on insulated non-steel piping. Oversize rollers and supports.

#### Welding Insulation Saddle: Install on insulated steel pipe. Oversize rollers and supports.

#### Vibration Isolation Pad: Install under base flange of pedestal type pipe supports adjacent to equipment, and where required to isolate vibration.

#### Dielectric Barrier:

##### Install between carbon steel members and copper or stainless steel pipe.

##### Install between stainless steel supports and non-stainless steel ferrous metal piping.

#### Electrical Isolation: Install 6.4 mm by 75 mm neoprene rubber wrap between submerged metal pipe and oversized clamps.

## Field Finishing

### Paint atmospheric exposed surfaces hot dip galvanized steel components as specified in Section 09900 – Painting and Protective Coatings.

## Supplements

### The supplements listed below, attached following “End of Section,” form part of this Section:

#### Table 1: Non-Chemical Areas.

#### Table 2: Chemical Areas.

**END OF SECTION**

|  |  |
| --- | --- |
| **Table 1 Non-chemical Areas** | |
| **Exposure Conditions** | **Hanger Material** |
| Office areas | Galvanized steel or pre-coated steel |
| Shops and warehouse areas | Galvanized steel or pre-coated steel |
| Pipe Galleries | Galvanized steel or pre-coated steel |
| Headworks | Stainless steel or FRP |
| Process areas: high humidity or hydrogen sulfide | Stainless steel or FRP |
| Process areas: wetted or submerged | Stainless steel or FRP |
|  |  |
|  |  |
|  |  |

Notes:

1. Pre-coated steel to be fusion bonded epoxy or vinyl copolymer (Plastisol).

2. Stainless steel to be Type 304.

3. Galvanized steel to be per ASTM A653/A653M-13, Class G90, or hot-dip galvanized after fabrication in accordance with ASTM A123/A123M-13.

4. Do not use galvanized steel or aluminum where lime dust can accumulate on these surfaces.

|  |  |  |
| --- | --- | --- |
| **Table 2 Chemical Areas** | | |
| **Exposure Conditions** | **Hanger for Direct Exposure** | **Hanger for Remote Exposure** |
| Alum | FRP | Pre-coated steel |
| Aqua Ammonia | Stainless steel | Pre-coated steel |
| Coagulants | FRP | Pre-coated steel or galvanized steel |
| Ferric Chloride | FRP | Pre-coated steel |
| Ferric Sulfate | FRP | Pre-coated steel |
| Hydrofluorosilic Acid | FRP | Pre-coated steel |
| Lime | Stainless steel; FRP, pre-coated steel | Stainless steel; FRP, pre-coated steel |
| Methanol | Galvanized steel | Galvanized steel |
| Polymers | FRP | Pre-coated steel |
| Potassium Permanganate | Pre-coated steel | Pre-coated steel |
| Powdered Activated Carbon | Pre-coated steel | Pre-coated steel |
| Sodium Carbonate | Stainless steel | Pre-coated steel |
| Sodium Hydroxide | Stainless steel | Pre-coated steel |
| Sodium Hypochlorite | FRP | Pre-coated steel |
| Sulfuric Acid | Stainless steel | Pre-coated steel |

Notes:

1. Direct exposure includes entire area within containment area; area within 6 m of chemical pumps or chemical mixing stations; or as specified in the Contract Documents.

2. Remote exposure is area beyond area defined as direct exposure, but within designated building.

3. Pre-coated steel to be fusion bonded epoxy or vinyl copolymer (Plastisol).

4. Stainless steel to be Type 304.

5. Galvanized steel to be per ASTM A653/A653M-13, Class G90, or hot-dip galvanized after fabrication to ASTM A123/A123M-13.

6. Do not use galvanized steel or aluminum where lime dust can accumulate on these surfaces.