Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 20 05 53 Mechanical Identification

.2 Section 22 05 29 Hangers and Supports for Piping

.3 Section 22 11 16 Plumbing Piping, Valves and Fittings

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 Canadian Standards Association (CSA International)

.1 CSA B139-04, Installation Code for Oil Burning Equipment.

.3 Green Seal Environmental Standards (GSES)

.1 Standard GS-11-2008, 2nd Edition, Environmental Standard for Paints and Coatings.

.4 National Fire Code of Canada (NFCC 2005)

.5 National Building Code of Canada (NBC 2015)

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

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, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

.1 Sustainability Standards Certification:

.1 Low-Emitting Materials: provide listing of sealants and coatings used in building, comply with VOC and chemical component limits or restriction requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 52 00, Section 01 74 21 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

Part 2 Products

2.1 MATERIAL

.1 Paint: zinc-rich to CAN/CGSB-1.181.

.2 Primers, Paints and Coating: Apply in accordance with manufacturer's recommendations for surface conditions.

.3 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.4 Fire Stopping:

.1 When combustible pipe passed through a rated assembly in both horizontal and vertical directions, a rated fire stop device is to be used on both sides of separation. Fire separation devices shall be in accordance with CAN4-S115. When non-combustible pipe passes thru a rated assembly in both horizontal and vertical direction, intumescent caulking shall be to fill all voids between pipe and wall on both sides of wall.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer, National Fire Code of Canada and CSA B139.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer and CSA B139 or as indicated without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.

.4 Discharge to be visible.

.5 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 PIPEWORK INSTALLATION

.1 Install pipework to CSA B139.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

3.6 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.

.2 Other floors: terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for firestopping.

.2 Maintain fire rating integrity.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.7 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one-piece type with set screws.

.1 Chrome or nickel-plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.8 PREPARATION FOR FIRE STOPPING

.1 Install firestopping within annular space between pipes, ducts, insulation and adjacent fire separation.

.2 Uninsulated unheated pipes not subject to movement: no special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.9 FLUSHING OUT OF PIPING SYSTEMS

.1 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.10 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections and provide written confirmation to Consultant.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

.6 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.11 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Departmental Representative.

.2 Request written approval by Departmental Representative 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

3.12 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.3 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1-2016, Power Piping.

.2 ASTM International

.1 ASTM A125-96 (2013), Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.

.1 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.2 MSS SP58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.

.3 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.

.4 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

1.2 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 Health and Safety Requirements.

1.3 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 shop drawings for:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Upper attachment

.5 Middle attachment

.6 Pipe attachment.

.7 Shields and saddles

.8 Sway braces

.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 for incorporation into manual.

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 in accordance with Section 01 52 00, Section 01 74 21 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58, and ANSI B31.1.

.2 Hangers and supports required for site conditions not listed herein shall be submitted to Departmental Representative for review prior to installation.

2.2 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 or vibration 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.

2.3 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized.

.2 Use electro-plating galvanizing process.

.3 Steel hangers, for copper piping shall be copper plated.

.2 Upper attachment to concrete:

.1 Inserts for cast-in-place concrete galvanized steel wedge to MSS-SP-58, type 18 ULC listed for pipe 19mm (3/4") through 200mm (8").

.2 Carbon steel plate with clevis, for surface mount: malleable iron socket and expansion case and bolt. Minimum two (2) expansion cases and bolts for each hanger. UL listed to MSS SP69.

.3 Hanger rods: Carbon steel 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.

.4 Pipe attachments: material to MSS SP58:

.1 Cold piping, steel or cast iron: hot piping steel, with less than 25mm (1") horizontal movement, hot piping, steel, with more than 300mm (12") middle attachment (rod) length: adjustable clevis to MSS-SP-58, type 1. ULC listed.

.2 Cold copper piping, steel or cast iron: hot piping steel, with less than 25mm (1") horizontal movement, hot copper piping, steel, with more than 300mm (12") middle attachment (rod) length: adjustable clevis to MSS-SP-58, type 1 Copper plated. ULC listed.

.3 Suspended hot piping, steel and copper, with horizontal movement in excess of 25mm (1"), hot steel piping with middle attachment (rod) 300mm (12") or less, pipe roller to MSS-SP-58, type 43.

.4 Bottom supported hot piping, steel and copper: pipe roller stand to MSS-SP-58, type 45.

.5 Use insulation shields for hot pipework.

.6 Oversize pipe hangers and supports.

2.4 INSULATION PROTECTION SHIELDS

.1 Length: Minimum 300mm (12").

.2 Cold piping 32mm (1 ¼") and over: protection shield with high density insulation under shield with uninterrupted vapour barrier.

.3 Hot piping 32mm (1 ¼") and over: protection shield with high density insulation under shield.

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 and as indicated.

.3 Clevis plates:

.1 Attach to concrete with four (4) minimum concrete inserts, one at each corner.

.4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.5 Use approved constant support type hangers where:

.1 Vertical movement of pipework is 13mm (1/2”) or more,

.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.6 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 Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table, whichever is more stringent.

.1 Plumbing piping: most stringent requirements of the National Plumbing Code of Canada or Authority Having Jurisdiction

.2 Fire protection: to applicable fire code.

.3 Copper piping: up to 13mm (1/2”): every 1.5m (5’-0”).

.4 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one (1) hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.5 Within 300mm (12”) of each elbow.

.6 Pipework greater than 300mm (12”): to MSS SP69.

.7 See table below:

Pipe Size	Rod Diameter	Max. Spacing Steel	Max. Spacing Copper
up to 32mm (1 ¼”)	10mm (3/8")	2.1m (7')	2.1m (7')
38mm (1 ½”)	10mm (3/8")	2.6 (8'-6")	2.4m (7'-9")

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 four (4) degrees from vertical.

.2 Where horizontal pipe movement is less than 13mm (1/2”), 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 CLEANING

.1 Progress Cleaning: clean in accordance with 01 74 11 – Cleaning.

.1 Leave work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with 01 74 11 – Cleaning.

.3 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 22 05 05 Installation of Pipework.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)

.1 ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.

.2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.5 Shall comply with NSF/ANSI 61 Annex G. for lead requirements. This applies to all wetted components for drinking water.

.6 ASTM B32-08, Standard Specification for Solder Metal.

.7 ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).

.8 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 ASTM International Inc.

.1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM A536-84(2004) e1, Standard Specification for Ductile Iron Castings.

.3 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube (Metric).

.3 Canadian Standards Association (CSA International).

.1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.

.2 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.

.3 CAN/CSA-B125.3-05, Plumbing Fittings.

1.3 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 Health and Safety Requirements.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 52 00, Section 01 74 21 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary and vent Type DWV to: ASTM B306.

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.3.

.2 Wrought copper: to CAN/CSA-B125.3.

.2 Solder: 95:5, type TA to ASTM B32.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for unit’s installation in accordance with manufacturer's written instructions.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install in accordance with NPC local authority having jurisdiction.

.2 Assemble piping using fittings manufactured to ANSI standards.

.3 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.3 TESTING

.1 Conform to requirements of Section 20 05 01 - Common Work Results for Mechanical.

3.4 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 recycling or disposal in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.

END OF SECTION