

PART 1 GENERAL1.1 RELATED SECTIONS

- .1 Section 23 05 05 - Installation of Pipework.
- .2 Section 23 05 17 - Welding.

1.2 REFERENCE

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - .2 ASTM A 105/A 105M-14, Standard Specification for Carbon Steel Forgings, for Piping Application.
 - .3 ASTM A 106/A 106M-14, Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service.
 - .4 ASTM A 108-13, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - .5 ASTM A 181/A 181M-14, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
 - .6 ASTM A 193/A 193M-14a, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications.
 - .7 ASTM A 194/A 194M-14a, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High Temperature Service, or Both.
 - .8 ASTM A 216/A 216M-14e1, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High-Temperature Service.
 - .9 ASTM A 234/A 234M-14, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - .10 ASTM A 278/A 278M-01(2011), Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperature Up to 650 Degrees F (350 Degrees C).
 - .11 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile.
- .2 American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B1.20.1-2013, Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B31.1-2014, Power Piping.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-14.5-M88, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

- .4 Health Canada, Workplace Hazardous Materials Information System (WHMIS 2015)
 - .1 Safety Data Sheets (SDS).
- .5 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS SP-58-2009, Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.3 SUBMITTALS

- .1 The steam and condensate piping falls in the category of Pressure Piping and shall therefore bear the necessary approvals by the Authority having Jurisdiction (Namely the Technical Standards and Safety Authority in Ontario.)
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS SDS - Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Include plans, elevations, sections and/or piping isometrics and/or construction details, including:
 - .1 Prefabricated sections with field connection points.
 - .2 Branch connections.
 - .3 Equipment connections
 - .4 Pipe supports.
 - .5 Expansion joints, anchors, and guides.
 - .6 Valves and Steam quick connect fittings.
 - .7 Steam Traps and check valves
 - .8 Pipeline identification data.
 - .2 Shop drawings for alternative systems for expansion loops (if proposed): include calculations based on temperature between minus 18 degrees C and system operating temperature plus 25%. Obtain Departmental Representative's acceptance before fabrication.
 - .3 Expansion joints: include relevant engineering data.
- .4 Quality assurance submittals: submit following:
 - .1 Test reports: submit certified test reports for specified materials from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
- .5 Closeout submittals:
 - .1 Provide operation and maintenance data

- .2 Record Drawings: provide, and include the following information:
 - .1 Information relating to elevations, inverts and location of piping, branches, anchors, expansion joints.
 - .2 Valve data.
 - .3 Details of permanent instrumentation.
 - .4 Details of permanent provisions for temporary instrumentation.
 - .5 Access points.
 - .6 Details of pipe grades, vents, drip points.
 - .7 Drainage provisions at low points
 - .8 Ventilation of manholes, valve chambers.
 - .9 Existing services uncovered during installation.
 - .10 Existing services known to exist within 3m of installation.

1.4 QUALITY ASSURANCE

- .1 Convene pre-installation meeting one (1) week prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other subtrades and Dam Operations.
 - .4 Review manufacturer's installation instructions and warranty requirements

1.5 SYSTEM START-UP

- .1 Provide continuous supervision during start-up.
- .2 Upon start-up, bring mains up to temperature and pressure slowly over a 24 hour period.
- .3 After system is in operation and under maximum temperatures and pressures:
 - .1 Tighten bolts on flanges, using torque wrench; repeat several times during commissioning.
 - .2 Check operation of drain valves and vent valves.
- .4 Expansion joints: during cooling down, monitor carefully to ensure complete freedom of movement. If binding occurs, shut down system, re-align and repeat start-up procedures.
- .5 Anchors, guides, supports:
 - .1 Monitor at all times during start-up and commissioning to ensure operation as designed.
 - .2 Adjust pipe supports and guides to ensure free movement.
- .6 Full scale tests: upon completion, conduct full scale tests at maximum design flow rates, operating temperatures and pressures for continuous consecutive period of six (6) hours.

1.6 COMMISSIONING

- .1 Provide three (3) days written notice to Departmental Representative of intention to start up, test, and adjust.
- .2 Start up systems only after written approval of installation Departmental Representative coordinating with the NRC CHCP personnel.

1.7 MAINTENANCE

- .1 Furnish special tools for maintenance of systems and equipment.
- .2 Include following:
 - .1 Lubricant gun for expansion joints.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Provide complete piping systems including:
 - .1 Piping, fittings, valves.
 - .2 Expansion joints, guides, anchors.
 - .3 Pipe supports, hangers, hardware.
 - .4 Thermal insulation.
 - .5 Waterproofing and jackets.
- .2 Valves:
 - .1 Repackable under full line pressure while fully open.
- .4 Operators
 - .1 Wormgear operators: All butterfly valves larger than NPS 150. Enclosed gear operator and handwheel, field interchangeable while under full line pressure.

2.2 STEAM PIPING - 600 kPa OP. PRESSURE (SATURATION TEMPERATURE 165 °C), DESIGN PRESSURE = 690 kPa

- .1 Piping: to ASTM A 53/A 53M, Grade B or ASTM A106.
 - .1 NPS 15 to 50 mm: Sch. 80, seamless or ERW plain end.
 - .2 NPS 65 and above: Sch. 40 seamless or ERW bevel end.
- .2 Fittings:
 - .1 NPS 15 to 50: Class 3000, 20 MPa, forged steel, socket weld ends, to ASTM A105/A 105M.
 - .2 NPS 65 to 250 mm: Sch. 40, seamless, bevel ends, to ASTM A 234/A 234M, Grade WPB.
- .3 Couplings, caps, plugs:
 - .1 NPS 15 to 40 mm: Class 3000, 20 MPa, socket weld, to ASTM A 105/A 105M.
- .4 Nipples for drains, vents, pressure gauges:

- .1 NPS 15 to 20 mm: Sch. 160, plain ends to ASTM A 106/A 106M Grade A.
- .6 All other nipples:
 - .1 NPS 15 to 40 mm: Sch. 80, plain ends to ASTM A 106/A 106M Grade A.
- .7 Outlet for reducing branch connections:
 - .1 Socket welding TEE with reducing insert for NPS 40 and smaller Class 3000, ASTM A 105/A 105M.
 - .2 Reduce welding TEE NPS 50 and larger. Where proper size unavailable, use TEE with reducer. Schedule to match run and branch pipe.
 - .3 For tie-in on existing line use reducing weldolet to ASTM A 105/A 105M, Schedule to match run and branch pipe.
- .8 Flanges:
 - .1 Class 150, 1 MPa, raised faced, socket welded, bored to Sch. 80, to ASTM A 105/A 105M.
- .9 Studs, bolts and nuts:
 - .1 Stud bolts: With heavy hex heads, alloy steel to ASTM A 193/A 193M, Grade B7
 - .2 Nuts: Semi-finished heavy hex, to ASTM A 194/A 194M, Grade 2H.
- .10 Gaskets:
 - .1 304 SS and flexite super (non-asbestos) filler c/w 3.175 mm thick carbon steel integral centering ring, type spiral wound, Class 150.
- .11 Gate valves:
 - .1 NPS 15 to 50 mm: Class 800, 5.5 MPa socket weld ends, forged steel body, union bonnet, solid wedge disc, Rising stem.
 - .2 NPS 65 to 300 mm: Class 150, 1 MPa raised faced flanged ends, cast steel body, hardened stainless steel trim, OS&Y, wedge disc.
- .12 Globe valves:
 - .1 NPS 15 to 50 mm: Class 800, 5.5 MPa, socket weld ends, forged steel body, union bonnet, hardened stainless steel plug type disc and seat.
- .13 Drain valves:
 - .1 Gate valves, NPS 20 mm, as specified above.
- .14 Steam Traps for main Steam header drip points**
 - .1 Thermodynamic disc type with integral strainer, screwed end.**

2.3 CONDENSATE RETURN – ATMOSPHERIC, DESIGN UP TO 690 kPa

- .1 Piping: to ASTM A 53/A 53M, Grade B (or A106).
 - .1 NPS 15 to 50 mm: Sch. 80, seamless or ERW plain end.
 - .2 NPS 65 to 250 mm: Sch. 40 seamless or ERW bevel end.
- .2 Fittings:

- .1 NPS 15 to 50 mm: Class 3000, 20 MPa, forged steel, socket weld ends, to ASTM A105/A 105M.
- .2 NPS 65 to 250 mm: Sch. 80, seamless, bevel ends, to ASTM A 234/A 234M, Grade WPB.
- .3 Couplings, caps, plugs:
 - .1 NPS 15 to 50 mm: Class 3000, 20 MPa, socket weld, to ASTM A 105/A 105M.
- .4 Nipples for drains, vents, pressure gauges:
 - .1 NPS 15 to 20 mm: Sch. 160, plain ends to ASTM A 106/A 106M Grade A.
- .5 All other nipples:
 - .1 NPS 15 to 40 mm: Sch. 80, plain ends to ASTM A 106/A 106M Grade A.
- .6 Outlet for reducing branch connections:
 - .1 Socket welding TEE with reducing insert for NPS 40 mm and smaller Class 3000, ASTM A 105/A 105M.
 - .2 For tie-in on existing line use reducing weldolet to ASTM A 105/A 105M, Schedule to match run and branch pipe.
- .7 Flanges:
 - .1 Class 150, 1 MPa, raised faced, socket welded, bored to Sch. 80, to ASTM A 105/A 105M.
- .9 Studs, bolts and nuts:
 - .1 Stud bolts: With heavy hex heads, alloy steel to ASTM A 193/A 193M, Grade B7
 - .2 Nuts: Semi-finished heavy hex, to ASTM A 194/A 194M, Grade 2H.
- .10 Gaskets:
 - .1 304 SS and flexite super (non-asbestos) filler c/w 3.2 mm thick carbon steel integral centering ring, type spiral wound, Class 150.
- .11 Gate valves:
 - .1 NPS 15 to 50 mm: Class 800, 5.5 MPa socket weld ends, forged steel body, union bonnet, solid wedge disc, Rising stem.
 - .2 NPS 65 to 300 mm and over: Class 150, 1 MPa, raised faced flanged ends, cast steel body, hardened stainless steel trim, OS&Y, wedge disc.
- .12 Globe valves:
 - .1 NPS 15 to 80 mm: Class 800, 5.5 MPa, socket weld ends, forged steel body, union bonnet, hardened stainless steel plug type disc and seat.
- .13 Drain valves:
 - .1 Gate valves, NPS 20 mm, as specified above.

2.4 ANCHORS, GUIDES, ROLLERS

- .1 Anchors:
 - .1 Provide as indicated.

- .2 Anchor to be welded to pipe and either bolted or welded to pipe rack.
- .3 Anchors to be painted or finished to resist corrosion from salt in winter.
- .4 Anchors to be designed to anchor against pipe expansion forces and movement.
- .2 Alignment guides:
 - .1 Provide pipe alignment guides as indicated.
 - .2 To accommodate specified thickness of insulation.
 - .3 Construction is carbon steel, all surfaces are hot dip galvanized with zing plated bolts and nuts.
 - .4 with shoe/saddle to accommodate for insulation thickness
 - .5 Vapour barriers installed to keep insulation dry, jackets to remain uninterrupted to avoid water infiltration.
- .3 Pipe roller:
 - .1 Adjustable steel yoke pipe roll with Cast iron roll; carbon steel yoke, roll rod and hex nuts
 - .2 Hot dip galvanized Yoke with Zinc Plated Parts or Resilient Coated
 - .3 For support of pipe lines where longitudinal movement due to expansion and contraction may occur and where vertical and lateral adjustment during installation may be required.
 - .4 With shoe/saddle to accommodate for insulation thickness
 - .5 Selection to be a low profile style to minimize the height of the pipe roller assembly.
 - .6 All steam and condensate pipes shall be supported using pipe rollers unless supported by anchors.

2.5 EXPANSION JOINTS-BELLOWS TYPE

- .1 For axial movements, for 100 mm axial movement.
 - .1 Maximum operating pressure: 600 kPa, design pressure 690 kPa.
 - .2 Maximum operating temperature: 165 degrees C.
 - .3 Type: externally pressurized, designed to eliminate pressure thrust, factory tested to 1½ times maximum working pressure. Provide test certificates.
 - .4 Materials: Single, A240-304 bellows with A53/106 Gr. B shell (or A516-70) std. wall shell and A105 A516-70 Flanges. Body to be painted.
 - .5 Ends: Flanges to match pipe.

2.6 SUPPORTS, HANGERS, INSERTS

- .1 In accordance with Section 2.4 above – all bracketry to be hot dip galvanized.
- .2 Components and assemblies to be to ANSI/MSS SP-58.
- .3 Use standard components and assemblies by one manufacturer wherever possible.
- .4 Submit shop drawings for approval before fabrication.

- .5 Percussion type inserts not permitted.
- .6 Power driven fasteners not permitted.

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 datasheets.

3.2 PREPARATION

- .1 Lay out work in accordance with lines and grades as indicated.
- .2 Verify floor profiles, grades, lines, levels, dimensions as indicated against established benchmarks. Report discrepancies to Departmental Representative and obtain written instruction.
- .3 When required by Departmental Representative, provide drawings showing relative locations of various services.

3.3 FABRICATION OF PIPING

- .1 Do work in accordance with ANSI/ASME B31.1.
- .2 Joints:
 - .1 Welded throughout, except at flanged components.
 - .2 Screwed joints: to ANSI/B1.20.1.
 - .1 Provide clean machine-cut threads.
 - .2 Use fluoropolymer resin tape or paste on male threads.
 - .3 Welding: in accordance with Section 23 05 17 - Pipe Welding.

3.4 INSTALLATION OF PIPING

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Maintain clearances between pipes as indicated.
- .3 Maintain clearance between pipes and structures for O&M as indicated, as directed and to manufacturer's recommendations.
- .4 Provide manual air vents, drains, drip legs, dirt pockets as specified and as indicated.
- .5 Provide for pipe movement as indicated and in accordance with expansion joint manufacturer's installation instructions.
- .6 Use eccentric reducers in horizontal piping to prevent accumulation of pockets of air or condensate.
- .7 Weld couplings for drains into piping in accordance with ANSI/ASME B31.1.
- .8 Branch take-offs:
 - .1 Use welding tees where indicated.

- .2 Where reducing tees of proper size are unavailable, use available tees with reducers. Tees with increasers not acceptable.
- .3 Weldolets may be used for tie-in on existing lines.
- .9 Cap open ends of piping during installation. Remove foreign material from inside piping.
- .10 Remove burrs from piping.
- .11 Grade nominally horizontal piping as indicated at 0.5% slope to low point for condensate drainage.
- .12 Flanges: tighten bolts evenly with torque wrench.
 - .1 Retighten bolts with torque wrench after system is in operation.
- .13 Revisions to location of piping require written approval of Departmental Representative.

3.5 EXPANSION JOINTS

- .1 Install to manufacturer's recommendations.
- .2 Install lubrication facilities on expansion joints where required.

3.6 ANCHORS AND GUIDES

- .1 Locate anchors and guides as indicated.
- .2 Align piping at expansion joints and guides so as to avoid damage by movement of piping against fixed structures.

3.7 PIPE SUPPORTS

- .1 Headers and condensate lines
 - .1 Refer to drawing for types and location.
 - .2 Install to manufacturer's recommendations.
 - .3 Adjust supports and hangers after system is in operation.
- .2 Expansion joints:
 - .1 Provide supports as indicated, to manufacturer's recommendations, as required to maintain venting and/or drainage.

3.8 VALVES

- .1 Install isolating valves at branch take-offs, at each piece of equipment and elsewhere as indicated.
- .2 Install in accordance with manufacturer's recommendations.
- .3 Install valves between weld neck flanges to ensure full compression of liner.
- .4 Install in accessible locations with stem horizontal or above.
- .5 Screwed and flanged valves to be accessible for maintenance without removing adjacent piping.

3.9 VALVED DRAINS

- .1 Locations:

- .1 At low points in mains and branches where equipment is to be serviced.
- .2 Elsewhere as indicated.
- .2 Discharge: provide hose adapter on drain valves where discharge piping cannot conveniently be carried to floor drains or drainage trench.

3.10 PRESSURE TESTS

- .1 Pressure test piping after having removed any part or equipment that has a rating less than test pressure
- .2 Test piping at 1035 kPa hydrostatic pressure and maintain pressure for 15 minutes for certification, then lower pressure to 600 kPa and hold for four (4) hours to monitor that there are no losses.

3.11 INSULATION

- .1 insulate pipe works only after having performed pressure test in accordance with the Specification 33 07 13 – Telethermics – piping insulation

3.12 FIELD QUALITY CONTROL

- .1 Inspections: leave joints in piping systems uncovered until tests are completed and system inspected and approved by Departmental Representative.
- .2 Re-coat hangers, supports, exposed steelwork where galvanized finish is damaged prior top commencement of insulation.

3.13 DEMONSTRATION AND TRAINING

- .1 Arrange for installer to demonstrate and train Departmental Representative's personnel in operation and maintenance of equipment.
- .2 Co-ordinate with PART 1 - System Start-Up and Commissioning.

END OF SECTION