

1. GENERAL

1.1 References

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C111/A21.11-06, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.1-10, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - .2 ASME B16.3-06, Malleable Iron Threaded Fittings: Classes 150 and 300.
 - .3 ASME B16.5-09, Pipe Flanges and Flanged Fittings: NPS through NPS 24 Metric/Inch Standard.
 - .4 ASME B16.9-07, Factory-Made Wrought Butt welding Fittings.
 - .5 ASME B18.2.1-10, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loded Head and Lag Screws (Inch Series).
 - .6 ASME B18.2.2-10, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
 - .7 ASME B31.1-2012, Power piping.
- .3 ASTM International
 - .1 ASTM A47/A47M-99(2009), Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - .3 ASTM A536-84(2009), Standard Specification for Ductile Iron Castings.
 - .4 ASTM B61-08, Standard Specification for Steam or Valve Bronze Castings.
 - .5 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .6 ASTM E202-10, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.
- .4 CSA International
 - .1 CSA B242-05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.
 - .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)
 - .1 MSS-SP-67-2002a, Butterfly Valves.
 - .2 MSS-SP-70-06, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-05, Gray Iron Swing Check Valves Flanged and Threaded Ends.
 - .4 MSS-SP-80-08, Bronze Gate, Globe, Angle and Check Valves.
 - .5 MSS-SP-85-02, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 Action and Informational 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 for hydronic systems 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 Territory of Nunavut Canada.
 - .2 Submit drawings for review and approval.
 - .3 Indicate on drawings:
 - .1 Components and accessories.
- .4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
- .5 Closeout Submittals:
 - .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Operation and Maintenance Data: submit operation and maintenance data for hydronic systems for incorporation into manual.
 - .1 Include special servicing requirements.

1.3 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for hydronic systems for incorporation into manual.
 - .1 Include special servicing requirements.

1.4 Extra Stock Materials

- .1 Supply spare parts as follows:
 - .1 Valve seats: 1 minimum for every ten valves, each size. Minimum one.
 - .2 Discs: 1 minimum for every ten valves, each size. Minimum one.
 - .3 Stem packing: 1 minimum for every ten valves, each size. Minimum one.
 - .4 Valve handles: 2 minimum of each size.
 - .5 Gaskets for flanges: 1 minimum for every ten flanges.

1.5 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect hydronic systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

2. PRODUCTS



2.1 Pipe

- .1 ~~Steel pipe: to ASTM A53/A53M, Grade B, as follows:~~
 - .1 ~~To NPS 6: Schedule 40.~~
 - .2 ~~NPS 8 and over, 10.~~
- .2 ~~- .1 ~~Buried heating water piping network~~
 - .1 ~~General:~~
 - .1 ~~All components of the piping system by the same manufacturer.~~
 - .2 ~~All straight sections, fitting, anchors and accessories to be factory fabricated, insulated and jacketed.~~
 - .3 ~~Field insulation of fitting is not allowed.~~
 - .4 ~~Piping system layout to be analyzed by the piping system manufacturer to determine the stresses and displacement of the service pipe.~~
 - .5 ~~Piping system system and manufacture to be in strict conformance with ASME B31.1~~
 - .6 ~~Piping system to include two (2) empty conduits network for the installation of heat tracing element.~~
 - .7 ~~Perform piping installation in accordance with manufacturer's instruction.~~
 - .2 ~~Service pipe:~~
 - .1 ~~Standard weight ASTM A53 Gr. B, ERW carbon steel.~~
 - .2 ~~Joints : butt welded.~~
 - .3 ~~Supply straight section in 12 meters length with piping exposed at each end for field joint fabrication.~~
 - .3 ~~Service pipe coating~~
 - .1 ~~Exterior steel pipe surface : abrasive blast cleaned to a minimum of a near white surface, SSPC SP10-63T. Profile must be a minimum of 1.5 mil peak to valley range. Any areas of rust bloom or oil to be wiped or reblasted.~~
 - .2 ~~Coat the steel service pipe with Zinc.~~
 - .3 ~~Zinc coating:~~
 - .1 ~~High solids inorganic zinc rich coating that protects the steel galvanically, thus eliminating sub-film corrosion.~~
 - .2 ~~Two part sprayable coating consisting of a liquid base portion and a dry powdered metal. The two components, when mixed together can be spray applied.~~
 - .3 ~~Dry film thickness in a range of 0.05 to 0.1 mm.~~~~

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- .4 Insulation
 - .1 Polyurethane foam insulation
 - .1 32 kg/m³ minimum density.
 - .2 90% minimum closed cell content.
 - .3 Maximum initial thermal conductivity : 0.026 W/m-°C.
 - .4 Insulation to fill completely the annular space between the service pipe and jacket and to be bonded to both.
 - .5 Insulation minimum thickness : 75 mm.
 - .5 Insulation jacket
 - .1 Outer protective insulation jacket
 - .1 Seamless high density polyethylene (HDPE) in accordance with ASTM D3350 minimum cell classification PE 345444 C.
 - .2 Minimum thickness : 2.54 mm.
 - .2 Accessories
 - .1 Elbows, tees, reducers, anchors, field joints and end seals
 - .2 Factory fabricated to prevent the ingress of moisture into the system
 - .3 Fittings
 - .1 Factory prefabricated and pre-insulated.
 - .2 Straight tangent lengths to be added to all ends so that all filed joints are at straight sections of pipe.
 - .3 Elbows insulation jackets
 - .1 Molded HDPE.
 - .4 Gluing, taping or hot air welding of the insulation jackets is not allowed.
 - .4 Field joints insulation
 - .1 Poured in place into the field joint area.
 - .2 Applied only in straight sections of pipe.
 - .3 Field joint insulation of fittings is not acceptable.
 - .4 Field joints to be sealed with a heat shrinkable adhesive backed sleeve
 - .5 Backfilling is not allowed until the heat shrink sleeve has cooled.
 - .6 Conduit for heat tracing element
 - .1 Quantity: 2
 - .2 Size: 20 mm
 - .3 Conduits to be embedded in the insulation
 - .4 Conduit to be continuous on the overall length of the network and c/w a polypropylene fish cord.
 - .7 Warning tape
 - .1 Polyethylene tape: 150 mm wide by 0.15 mm thick as approved by Departmental Representative.
 - .2 Tape for heating pipes: red in colour with factory applied markings at one metre intervals, i.e. "Caution Buried Heating Line".
 - .8 Buried warning identification tape
 - .1 Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification or buried piping.
 - .2 Tape: detectable by electronic detection instrument.
 - .3 Provide tape in rolls, 75 mm width, colour for utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length.

- .4 ~~Warning and identification: read “CAUTION BURIED PREINSULATED PIPING BELOW” or similar wording.~~
- .5 ~~Use permanent code and letter colouring unaffected by moisture and other substances contained in trench backfill material.~~
- .9 ~~Operating design criteria~~
- .1 ~~Temperature: 85°C.~~
- .2 ~~Pressure: 1035 kPa.~~
- .3 ~~Heating media: Polypropylene glycol 50%.~~

	DIAMETER		SPECIFICATION	DESCRIPTION	MATERIAL AND ASTM STANDARDS	
	FROM	TO			A.S.T.M.	
PIPE	13 mm	50 mm	Cal. 40	Continuous seal,	Black steel A.53, grade B	
	65 mm	300 mm	Cal. 40	threaded ends	Black steel A.53, grade B (ERW)	
	350 mm	600 mm	Cal. 30	elect Joint . (ERW), chamfered ends	Black steel A.53, grade B (ERW)	
ASSEMBLY	13 mm	50 mm		Screwed	ASME/ANSI B16.9-2001 with complete penetration.	
	65 mm	600 mm		Buttwelded		
FITTINGS	13 mm	50 mm	1035 kPa	Screwed	malleable cast iron A.47	
	65 mm	600 mm	Std.	No joint, chamfered ends	forged steel	
FLANGES	65 mm	600 mm	1035 kPa	Colar and a) Saliente of 1/16 po or b) Surface for cast iron flange	forged steel A.181, Grade 1	
UNIONS	13 mm	50 mm	1035 kPa	Grounf joint, bronze to cast iron, Screwed	malleable cast iron A.47	
BOLTS	Robust hex screws and nuts, semi-finished				STEEL A.307	
GARNITURE	THICKNESS : 1,6 mm				EPDM	
DATE :				DESIGN	SERVICE	TEST
RÉV. :	N./P. :		PRESSURE kPa	1035	860	1375
			TEMP. °C	120	120	AMBIENT
						HYDRO- STATIC
<u>PIPING AND VALVE STANDARDS</u>			<u>HEATING WATER</u>			<u>Table 23 21 13.02</u>

2.2 Pipe Joints

- .1 — NPS 2 and under: screwed fittings with PTFE tape

- ~~.2 — NPS 2-1/2 and over: welding fittings and flanges to CSA W48.~~
- ~~.3 — Flanges: plain or raised face, slip on or weld neck to ANSI/AWWA C111/ A21.11.~~
- ~~.4 — Orifice flanges: slip on raised face, 2100 kPa.~~
- ~~.5 — Flange gaskets: to ANSI/AWWA C111/ A21.11.~~
- ~~.6 — Pipe thread: taper.~~
- ~~.7 — Bolts and nuts: to ASME B18.2.1, ASME B18.2.2.~~



2.3 Fittings

- ~~.1 — Screwed fittings: malleable iron, to ASME B16.3, Class 150.~~
- ~~.2 — Pipe flanges and flanged fittings:

 - ~~.1 Cast iron: to ASME B16.1, Class 125.~~
 - ~~.2 Steel: to ASME B16.5.~~~~
- ~~.3 — Butt welding fittings: steel, to ASME B16.9.~~
- ~~.4 — Unions: malleable iron, to ASTM A47/A47M ASME B16.3.~~

2.4 Valves

- .1 Connections:
 - .1 NPS 2 and smaller: screwed ends.
 - .2 NPS 2-1/2 and larger: flanged ends.
- .2 Gate valves: to MSS-SP-70 to MSS-SP-80 application: isolating equipment, control valves, pipelines and as indicated:
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms : Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 NPS 2-1/2 and over:
 - .1 Mechanical Rooms: rising stem, split wedge disc, bronze trim, as specified Section 23 05 23.02 - Valves - Cast Iron.
 - .1 Operators: manual .
 - .2 Elsewhere: non- rising stem, solid wedge disc, bronze trim, as specified Section 23 05 23.02 - Valves - Cast Iron.
 - .1 Operators: Handwheel.
- .3 Butterfly valves: to MSS-SP-67, application: isolating cells or section of multiple component equipment (i.e. multi-section coils, multi-cell cooling towers)and as indicated:
 - .1 NPS 2-1/2 and over: lug type: as specified Section 23 05 17 - Pipe Welding.

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- .4 Globe valves: application: throttling, flow control, emergency bypass or as indicated to MSS-SP-80:
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: with PTFE disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 Elsewhere: globe, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 NPS 2-1/2 and over:
 - .1 With composition disc, bronze trim, as specified Section 23 05 23.02 - Valves - Cast Iron.
 - .2 Operators: Handwheel.
 - .5 Balancing, for TAB:
 - .1 Sizes: calibrated balancing valves, as specified this section.
 - .2 NPS 2 and under:
 - .1 Mechanical Rooms: globe, with plug disc as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 Elsewhere: globe, with plug disc as specified Section 23 05 23.01 - Valves - Bronze.
 - .6 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .7 Bypass valves on gate valves NPS 8 and larger: NPS 3/4, Globe, with PTFE disc as specified Section 23 05 23.01 - Valves - Bronze.
 - .8 Swing check valves: to MSS-SP-71.
 - .1 NPS 2 and under:
 - .1 Class 125, swing, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 NPS 2-1/2 and over:
 - .1 Flanged ends: as specified Section 23 05 23.02 - Valves - Cast Iron.
 - .9 Silent check valves:
 - .1 NPS 2 and under:
 - .1 As specified Section 23 05 23.01 - Valves - Bronze.
 - .2 NPS 2-1/2 and over:
 - .1 Flanged ends: as specified Section 23 05 23.02 - Valves - Cast Iron.
 - .10 Ball valves:
 - .1 NPS 2 and under: as specified Section 23 05 23.01 - Valves - Bronze.
 - .11 Lubricated Plug Valves
 - .1 NPS 2 and under: N/A
 - .2 NPS 2-1/2 and over:
 - .1 As specified Section 23 05 23.02 - Valves - Cast Iron.

3. EXECUTION

3.1 Examination

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic systems installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 Piping Installation

- .1 Install pipework in accordance with Section 23 05 05 - Installation of Pipe Work.
- .2 Slope piping in direction of drainage and for positive venting.

3.3 Circuit Balancing Valves

- .1 Install flow measuring stations and flow balancing valves as indicated.
- .2 Remove handwheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.4 Cleaning, Flushing and Start-Up

- .1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.5 Testing

- .1 Test system in accordance with Section 21 05 01 - Common Work Results for Mechanical.
- .2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.6 Balancing

- .1 Balance water systems to within plus or minus 5 % of design output.
- .2 In accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.7 Glycol Charging

- .1 Include mixing tank and positive displacement pump for glycol charging.
- .2 Retest for concentration to ASTM E202 after cleaning.

3.8 Performance Verification

- .1 In accordance with Section 23 08 01 - Performance Verification Mechanical Piping Systems.

3.9 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.

3.10 Protection

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by hydronic systems installation.

End of Section