
Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1-2007, Power Piping.
 - .2 ANSI/ASME B31.3-2006, Process Piping.
 - .3 ANSI/ASME Boiler and Pressure Vessel Code-2007:
 - .1 BPVC 2007 Section I: Power Boilers.
 - .2 BPVC 2007 Section V: Nondestructive Examination.
 - .3 BPVC 2007 Section IX: Welding and Brazing Qualifications.
- .2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C206-03, Field Welding of Steel Water Pipe.
- .3 American Welding Society (AWS)
 - .1 AWS C1.1M/C1.1-2000(R2006), Recommended Practices for Resistance Welding.
 - .2 AWS Z49.1-2005, Safety in Welding, Cutting and Allied Process.
 - .3 AWS W1-2000, Welding Inspection Handbook..
- .4 Canadian Standards Association (CSA International)
 - .1 CSA W47.2-M1987(R2008), Certification of Companies for Fusion Welding of Aluminum.
 - .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
 - .3 CSA B51-03(R2007), Boiler, Pressure Vessel and Pressure Piping Code.
 - .4 CSA-W117.2-2006, Safety in Welding, Cutting and Allied Processes.
 - .5 CSA W178.1-2008, Certification of Welding Inspection Organizations.
 - .6 CSA W178.2-2008, Certification of Welding Inspectors.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Welders:
 - .1 Welding qualifications in accordance with CSA B51.
 - .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.

- .3 Submit welder's qualifications to Departmental Representative DCC Representative Consultant Owner.
- .4 Each welder to possess identification symbol issued by authority having jurisdiction.
- .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.
- .2 Inspectors:
 - .1 Inspectors qualified to CSA W178.2.
- .3 Certifications:
 - .1 Registration of welding procedures in accordance with CSA B51.
 - .2 Copy of welding procedures available for inspection.
 - .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 ELECTRODES

- .1 Electrodes: in accordance with CSA W48 Series.

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 QUALITY OF WORK

- .1 Welding: in accordance with ANSI/ASME B31.1 using procedures conforming to provincial authority having jurisdiction.

3.3 INSTALLATION REQUIREMENTS

- .1 Identify each weld with welder's identification symbol.
- .2 Backing rings:
 - .1 Where used, fit to minimize gaps between ring and pipe bore.

- .2 Do not install at orifice flanges.
- .3 Fittings:
 - .1 NPS 2 and smaller: install welding type sockets.
 - .2 Branch connections: install welding tees or forged branch outlet fittings.

3.4 INSPECTION AND TESTS - GENERAL REQUIREMENTS

- .1 Review weld quality requirements and defect limits of applicable codes and standards with Departmental Representative before work is started.
- .2 Formulate "Inspection and Test Plan" in co-operation with Departmental Representative.
- .3 Do not conceal welds until they have been inspected, tested and approved by inspector.
- .4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.5 SPECIALIST EXAMINATIONS AND TESTS

- .1 General:
 - .1 Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by Departmental Representative.
 - .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
 - .3 Inspect and test 100 % of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination.
- .2 Hydrostatically test welds to ANSI/ASME B31.1.
- .3 Visual examinations: include entire circumference of weld externally and wherever possible internally.

3.6 DEFECTS CAUSING REJECTION

- .1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.
- .2 In addition, chilled water systems below 1000 kPa:
 - .1 Undercutting greater than 0.8 mm adjacent to cover bead on outside of pipe.
 - .2 Undercutting greater than 0.8 mm adjacent to root bead on inside of pipe.
 - .3 Undercutting greater than 0.8 mm at combination of internal surface and external surface.
 - .4 Incomplete penetration and incomplete fusion greater than total length of 38 mm in 1500 mm length of weld depth of such defects being greater than 0.8 mm.
 - .5 Repair cracks and defects in excess of 0.8 mm in depth.
 - .6 Repair defects whose depth cannot be determined accurately on basis of visual examination.

3.7 REPAIR OF WELDS WHICH FAILED TESTS

- .1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and components for metering potable water including installation.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 23 05 17 – Pipe Welding.

1.2 MEASUREMENT AND PAYMENT

- .1 Refer to section 23 20 13 – Pressure Piping.

1.3 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME Fluid Meter's Handbook: Their Theory and Application, Sixth Edition 1971.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submittals to include:
 - .1 Piping configuration and sizing - straight pipe upstream and downstream, distances to first weld, protrusion, thermowell, pressure tap.
 - .2 Service conditions.
 - .3 Full details of primary element - standard of design and construction, materials, type serial number, flow rate, differential pressure, irrecoverable head loss (IHL), calculation sheets.
 - .4 Accuracy statements for each component at specified flow rates and other conditions.
 - .5 Flow and temperature ranges.
 - .6 Signal processor calibration data.

- .7 Minimum turndown ratio.
- .4 Samples:
 - .1 Submit sample in accordance with Section 01 33 00 - Submittal Procedures.
- .5 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.
- .6 Closeout Submittals:
 - .1 Submit maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 WATER METERING

- .1 Type of metering: Electromagnetic flow meter.
- .2 Design data:
 - .1 Flow rates: 0-63.1 L/s (0-1000 USgpm).
 - .2 Pressure Rating: 150 PSIG
 - .3 Water Temperature 0-25 °C
- .3 Flow Transmitter shall be mounted on the flow sensor.
- .4 Available lengths of straight pipe to first fitting, and intrusion: as shown on the drawings.
- .5 Diameter of main for installation of primary element: as noted on the drawings.
- .6 Acceptable types of readout instruments:
 - .1 Integrators: 6-digit, 8 mm high lettering, non-reset.
- .7 Read-out instrument display:
 - .1 Water flow rate: L/s, USgpm or Imp. gpm.
 - .2 Total flow: USGal., m3 or Imp. Gal.
- .8 Signal transmission between primary measuring element and signal conditioners:
 - .1 Power: 115 VAC powered.
 - .2 Signal: 4-20 mA.

- .3 Cable: colour coded, twisted and shielded pair with grounding wire.
- .9 Locations and installation mountings:
 - .1 Transmitters: Mounted on the flow meter.
 - .2 Signal conditioners: Integrated to flow meter.
 - .3 Computing devices: Integrated to Transmitter.
- .10 Additional Requirements:
 - .1 Signal Converter (Transmitter) shall have at least the following:
 - .1 115 Vac powered.
 - .2 $\pm 0.25\%$ accuracy of rate.
 - .3 1 x 4-20 mA (HART) & 1 x pulse outputs.
 - .4 1 x status input.
 - .5 Display of instantaneous flow and total flow, 3 line with 20 characters.
 - .2 Flow meter shall be CSA approved, field programmable, NEMA 4X enclosure, complete with polyurethane liner, designed to measure flow for clean potable water, with flow rates varying.
 - .3 Flow meter housing to be epoxy coated.
 - .4 Flange: ANSI B16.1, Class 125 with EPDM gaskets.
 - .5 Flow meter shall be supplied with a factory calibration certificate.
 - .6 Flow meter to be supplied with grounding rings.
 - .7 Acceptable Products:
 - .1 Siemens Mag 5100 W c/w Mag 6000 transmitter.
 - .2 Krohne Enviromag 2000 c/w IFC 300 transmitter or approved equal.

2.2 PRESSURE GAUGES

- .1 Gauge installations shall be complete with all tubing and fittings, and shall include a shut off valve, tee and nut (clean-out) installed in each gauge inlet at the point of connection to suction and discharge pipes.
- .2 Gauges to be glycerine filled.
- .3 Dual indication dial range: 270° – 0 to 145 psi (0 to 1000 kPa) to be white with black figures and gradations c/w clear glass window.
- .4 Dial size: 100 mm (4").
- .5 Case, ring and pointer: Stainless steel.
- .6 Accuracy: 1% of full scale reading.
- .7 Acceptable product: US Ametek or approved equal.

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 OF PRIMARY ELEMENT

- .1 Follow manufacturer's instructions.

3.3 INSTALLATION OF SIGNAL TRANSMISSION CABLE

- .1 Ground shielding at one point only.
- .2 Protect against RF interference.
- .3 Cross electrical cables, conduits at 90 degrees leaving at least 150 mm space between.

3.4 START-UP

- .1 Follow manufacturer's recommendations.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.

1.2 MEASUREMENT AND PAYMENT

- .1 Refer to section 23 20 13 – Pressure Piping.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International
 - .1 ASTM A276-08, Standard Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283-08a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505/B505M-08a, Standard Specification for Copper-Base Alloy Continuous Castings.

1.4 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 equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 CLOSEOUT SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Packaging Waste Management: remove of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

2.2 STAINLESS STEEL BALL VALVES:

- .1 Working pressure: 1500 PSI
- .2 Body and Ball: Stainless Steel 316
- .3 Handle and nut: Stainless Steel 304
- .4 Long cycle life.
- .5 Blow-out proof stem.
- .6 Locking device.
- .7 ANSI B16.34 Class 900
- .8 Acceptable Product: Pinnacle 1500 WOG Ball Valve or approved alternate.

2.3 COMBINATION AIR RELEASE VALVES:

- .1 All valves to be coated internally and externally with an ANSI/NSF61 approved fusion bonded epoxy suitable for potable drinking water. All valves to be colour coded blue. Related nuts and bolts required on valve body shall be stainless steel 316. Valves shall be suitable for potable water application.
 - .1 Combination air valves;
 - .2 Body Material: Ductile Iron to ASTM A536 Grade 65-45-12;
 - .3 Float Material: Stainless Steel;
 - .4 Seat: Buna-N to ASTM D20000-BG;
 - .5 Air release valve shall be complete with stainless steel treaded nipples, isolating valve and PVC Sch.40 discharge pipe to be piped 600mm to floor;
 - .6 Air release valve shall be installed as per Manufacturer's recommendations;
 - .7 Acceptable Product: Val-Matic (201C.2), Cla-Val (Model 33A) or approved equal.

2.4 DOUBLE CHECK VALVE ASSEMBLY:

- .1 Install double check valve assembly as shown on drawings and as per manufacturer's recommendations.
- .2 Designed for installation on potable water lines to protect against both backsiphonage and backpressure of polluted water into the potable water supply.

- .1 Lead-Free
- .2 AWWA C510
- .3 NSF 61 Listed
- .4 Materials:
 - .1 Main body and access covers: 304L Stainless Steel.
 - .2 Internal components: Stainless Steel.
 - .3 Seal: EPDM.
- .5 Maximum working pressure: 175 PSI
- .6 Hydrostatic test pressure: 350 PSI
- .7 End Connections: Flanged ANSI B16.1 Class 125
- .8 Valves: Flanged end NRS Gate Valves.
- .9 Accessories: Repair kit.
- .10 Acceptable Product: Zurn Wilkins Model 350AST, Watts Series 774 or approved equal.

Part 3 Execution

3.1 INSTALLATION

- .1 Install valves as shown on drawings and as per manufacturer's recommendations.

3.2 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.2 MEASUREMENT AND PAYMENT

- .1 Refer to section 23 20 13 – Pressure Piping Systems Inside Building.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.1-05, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25,125 and 250.
 - .2 ANSI/ASME B16.5-03, Pipe Flanges and Flanged Fittings: NPS through 24.
 - .3 ANSI/ASME B16.34-04, Valves - Flanged, Threaded and Welding Ends.
- .2 ASTM International Inc.
 - .1 ASTM A126-04), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .2 ASTM A536-84(2004)e1, Standard Specification for Ductile Iron Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - .1 MSS SP-67-02a, Butterfly Valves.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets for valves and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit data for valves specified in this section.

1.5 CLOSEOUT SUBMITTALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- .1 Furnish following spare parts:
 - .1 Valve seats: one for every 10 valves each size, minimum 1.
 - .2 Stem packing: one for every 10 valves, each size, minimum 1.
 - .3 Gaskets for flanges: one for every 10 flanged joints, minimum 2.

Part 2 Products

2.1 BUTTERFLY VALVES - RESILIENT SEAT

- .1 Butterfly valves shall be sized in accordance with the drawings. Valves shall be butterfly valve type and complete with flange end connections with the following specifications:
 - .1 One (1) Piece Body: Ductile Iron to ASTM A536 or Cast Iron to ASTM A126 Class B;
 - .2 Type: Full Lug;
 - .3 Seat Material: EPDM;
 - .4 Disc Material: Stainless Steel 316;
 - .5 Shaft Material: Stainless Steel 316;
 - .6 Taper pin Disc shall not be pinned to shaft;
 - .7 Key: 316 Stainless Steel;
 - .8 Coating: Fused bonded epoxy coating or polyester coating suitable for exterior application;
 - .9 Nuts and Bolts: Stainless Steel 316;
 - .10 Operator: Handwheel with gear operator;
 - .11 Acceptable Product: Series 31 Bray butterfly valve or approved equal.

Part 3 Execution

3.1 PREPARATION

- .1 Valve and mating flange preparation.
 - .1 Inspect adjacent pipeline, remove rust, scale, welding slag, other foreign material.
 - .2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.
 - .3 Install butterfly valves with disc in almost closed position.
 - .4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.2 INSTALLATION OF VALVES

- .1 Install in accordance with manufacturer's instructions.

- .2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.
- .3 Verify suitability of valve for application by inspection of identification tag.
- .4 Handle valve with care so as to prevent damage to disc and seat faces.
- .5 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

3.3 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Clean installed products in accordance to manufacturer's recommendation.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

- .1 For Hangers and Supports install inside the building: Refer to section 23 20 13 – Pressure Piping Systems Inside Building.
- .2 For Hangers and Supports install on the wharf: Refer to section 33 11 18.02 – Wharf Water Distribution Piping.

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-07, Power Piping.
- .2 ASTM International
 - .1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

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.
 - .2 Submit shop drawings for:
 - .1 Bases, hangers and supports.
- .3 Manufacturers' Instructions:
 - .1 Provide manufacturer'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 Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 GENERAL

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

2.3 ADJUSTABLE PIPE ROLL SUPPORT

- .1 Adjustable pipe roll support shall be supplied as shown on drawings c/w galvanized threaded rods, nuts and pipe saddle.
- .2 Material: Cast iron roll.
- .3 Finish: Galvanized.
- .4 Adjustable pipe roll support shall be Anvil Fig 177 Adjustable Pipe Roll Support or approved equal.

2.4 FLOOR MOUNTED PIPE SUPPORT

- .1 Floor mounted pipe support shall be constructed and installed inside building as shown on drawings.
- .2 Material: Galvanized or Stainless Steel.
- .3 Acceptable Product: Anvil Fig. 63T pipe stanchion c/w Fig. 264 adjustable pipe saddle support or approved equal.

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 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .3 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.

3.3 HANGER SPACING

- .1 Plumbing piping: to Canadian Plumbing Code and authority having jurisdiction.
- .2 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

- .3 Pipework greater than NPS 12: to MSS SP69.

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 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.

3.6 FIELD QUALITY CONTROL

- .1 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.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and requirements for the identification of piping systems, valves and controllers, including the installation and location of identification systems.
- .2 Related Requirements
 - .1 Section 23 05 23 – Valves.
 - .2 Section 23 05 23.05 – Butterfly Valves.
 - .3 Section 23 20 13 – Pressure Piping Systems Inside Buildings.

1.2 MEASUREMENT AND PAYMENT

- .1 Refer to section 23 20 13 – Pressure Piping Systems Inside Building.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-24.3-92, Identification of Piping Systems.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data to include paint colour chips, other products specified in this section.

1.5 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Dispose of unused paint material at official hazardous material collections site.
 - .3 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: manufacturer's name, model, size, serial number, capacity.

2.2 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
 - .1 Equipment in Mechanical Rooms: use size # 9.
- .5 Identification for PWGSC Preventive Maintenance Support System (PMSS):
 - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
 - .2 Equipment in Mechanical Room:
 - .1 Main identifier: size #9.
 - .2 Source and Destination identifiers: size #6.
 - .3 Terminal cabinets, control panels: size #5.
 - .3 Equipment elsewhere: sizes as appropriate.

2.3 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
- .7 Colours and Legends:
 - .1 Where not listed, obtain direction from Departmental Representative.
 - .2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
** Add design temperature		
++ Add design temperature and pressure		
City water	Green	CITY WATER

2.4 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm stamped identification data filled with black paint.

- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.5 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

2.6 LANGUAGE

- .1 Identification in English and French.
- .2 Use one nameplate and label for both languages.

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 TIMING

- .1 Provide identification only after painting has been completed.

3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Identify systems, equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
 - .1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING

- .1 On straight runs in open areas to ensure that at least one is visible from any one viewpoint.
- .2 Adjacent to each change in direction.

- .3 At least once in each small room through which piping passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 At beginning and end points of each run and at each piece of equipment in run.
- .7 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .8 Identification easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Number valves in each system consecutively.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 23 05 17 - Pipe Welding.
- .3 Section 23 05 29 - Hangers and Supports for Piping.
- .4 Section 23 05 53.01 - Mechanical Identification.

1.2 MEASUREMENT AND PAYMENT

- .1 Pressure piping system inside building will be paid by the lump sum.
 - .1 Payment shall include the supply and transportation of all labour, equipment and materials, excavation, dewatering, supply and installation of all pipe and fittings including supply and installation of underground stainless steel piping, flow meter, double check valve assembly , pressure gauges, air valve, butterfly valves, mechanical identification, joint restraint systems, thrust blocks and anchors, pipe supports, bedding, backfilling, compaction, protection of adjacent services and structure, testing, flushing and disinfection, removal and disposal of excess material, shop drawings, clean-up, and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer-Architect.

1.3 REFERENCES

- .1 American Iron and Steel Institute (AISI)
- .2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
 - .2 ASME B31.1-07, Power Piping.
- .3 ASTM International
 - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .2 ASTM A193/A193M-08b, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - .3 ASTM A194/A194M-08b, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - .4 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .4 CSA International
 - .1 CSA B51-09, Boiler, Pressure Vessel and Pressure Piping Code.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

- .1 Provide Project Record Documents in accordance with Section 01 78 00 - Closeout Submittals supplemented with:
 - .1 Information relating to elevations, inverts and location of piping.
 - .2 Valve data.
 - .3 Details of permanent instrumentation.
 - .4 Drainage provisions at low points.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Packaging Waste Management: remove for reuse and return of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 PIPE AND FITTINGS

- .1 Piping and fittings:
 - .1 Interior of building: shall be Schedule 10 type 304L stainless steel as shown on the drawings. The fittings shall be welded stainless steel fittings as shown on the drawings. All piping inside the building shall be cleaned by acid wash.
 - .1 Stainless steel Sch. 10 piping may also be roll-grooved for Victualic fittings, Victualic flanges and Victualic Style 89 rigid coupling with

ductile iron housing conforming to ASTM A-536, Grade 65-45-12. All connections shall include EPDM gaskets (printed).

- .2 All buried pipes shall be Schedule 40 type 304L stainless steel unless specified otherwise.
- .3 All buried stainless steel fittings shall be welded.
- .4 Piping shall be supported as shown on the drawings.
- .2 Gaskets:
 - .1 Will be 1.6 mm thick, rubber and flat ring.
- .3 Nuts and Bolts:
 - .1 All nuts and bolts shall be heavy head machine bolts and nuts, stainless steel Type 316, for inside the building. Use a suitable thread compound to prevent galling when tightening the bolts. All nuts shall be re-tightened after initial installation to ensure that they have not become loose.

2.2 VALVES

- .1 Refer to Section 23 05 23 – Valves.
- .2 Refer to Section 23 05 23.05 – Butterfly Valves.

2.3 PRESSURE GAUGES

- .1 Refer to Section 23 05 19 – Meters and Gauges for Water Piping.

2.4 FABRICATION

- .1 Do work in accordance with ASME B31.1.
- .2 Joints:
 - .1 Accessible locations: screwed, flanged or welded to match piping specification.
 - .2 Elsewhere: welded throughout, except at flanged components.
 - .3 Grooved joints on applicable systems in lieu of welded, flanged, or screwed joints and components.
- .3 Branch connections:
 - .1 Use butt or socket-weld fittings.
 - .2 Mains NPS 2-1/2 and smaller: use weldolets, threadolets, or 2 Mpa half couplings as reinforcements.
 - .3 Mains NPS 3 and larger: welded branch connections can be used.
 - .4 In grooved systems: tees and reducing tees can be used.

Part 3 Execution

3.1 PREPARATION

- .1 Lay out work in accordance with lines and grades as indicated.

- .2 Verify 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.

3.2 WELDING

- .1 Perform welding in accordance with Section 23 05 17 - Pipe Welding supplemented as specified herein.
- .2 Notwithstanding the requirements of referenced section, the following shall apply:
 - .1 Welding to be in accordance with ASME B31.1.
 - .2 Welding to be executed by certified pipe welders.
 - .3 Pipe fitting to be executed by certified pipe fitters.

3.3 GROOVED JOINTS

- .1 Install grooved joints in accordance with manufacturer's latest published installation instructions.
- .2 Ensure grooved ends are: clean, free from indentations, projections, and roll marks in the area from pipe end to groove.
- .3 Select gaskets with elastomer grade suitable for service and produced by coupling manufacturer.

3.4 INSTALLATION

- .1 Installation to be performed by certified pipe fitters.
- .2 Install pipework as shown on drawings.
- .3 Clearances:
 - .1 Maintain clearance around systems, equipment and components and between pipes and structures for O M to manufacturer's recommendations.
- .4 Flanges: use suitable graphite lubricant on bolts and nuts.
- .5 Butterfly valves: install between weld-neck flanges.
- .6 Branch take-offs:
 - .1 Use welding tees.
 - .2 Where reducing tees of proper size are unavailable, use available tees with reducers. Tees with increasers not acceptable.
- .7 Cap open ends of piping during installation. Remove foreign material from inside piping.
- .8 Grade nominally horizontal piping at 0.4% slope to high point for air removal.
- .9 Flanges: tighten bolts evenly with torque wrench.
- .10 Revisions to location of piping require written approval of Departmental Representative.
- .11 Connections to equipment:

- .1 Use flanged valves for isolation and ease of maintenance and assembly.

3.5 PIPE SUPPORTS

- .1 In accordance with Section 23 05 29 - Hangers and Supports for Piping, supplemented as specified herein.
- .2 Install to manufacturer's recommendations.

3.6 VALVES

- .1 Install isolating valves at branch take-offs, at pieces of equipment and elsewhere as indicated.
- .2 Install in accordance with manufacturer's recommendations.
- .3 Install butterfly valves, where specified, between weld neck flanges to ensure full compression of liner.
- .4 Install in accessible locations.
- .5 Valves to be accessible for maintenance without removing adjacent piping.

3.7 FIELD QUALITY CONTROL

- .1 Inspections:
 - .1 Leave joints in piping systems uncovered until tests are completed and system inspected as directed by Departmental Representative.
 - .2 Departmental Representative to inspect new piping prior to hydrostatic pressure tests for compliance with approved drawings and specifications.
 - .3 Obtain from Departmental Representative requirements for inspection and testing of system modifications, design changes and repairs performed in-house.
 - .4 Pay costs for inspections.

3.8 HYDROSTATIC PRESSURE TESTS:

- .1 Refer to Section 33 11 18.01 – Water Main Piping.

3.9 FLUSHING AND CLEANING

- .1 Refer to Section 33 11 18.01 – Water Main Piping.

3.10 COMMISSIONING

- .1 Instrumentation: verify accuracy of pressure gauges by comparison with calibrated test instruments.
- .2 Full scale tests: upon completion, conduct full scale tests at maximum design flow rates, operating temperatures and pressures for continuous consecutive period of 2 hours to demonstrate compliance with design requirements.

3.11 IDENTIFICATION

- .1 In accordance with Section 23 05 53.01 - Mechanical Identification, supplemented as specified herein.

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- .2 In addition, identify piping at building entries.

3.12 DEMONSTRATIONS

- .1 Operate at design temperatures, pressures, flow rates for consecutive period of 2 hours to demonstrate compliance with design criteria and design intents.
- .2 Demonstrations also to show completeness of O M personnel training.

END OF SECTION