

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of pipe, supports, and fixture carriers.
 - .2 Points of operation on performance curves.
 - .3 Manufacturer to certify current model production.
 - .4 Certification of compliance to applicable codes.
- .4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .5 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, the Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Description of systems and their controls.
 - .2 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .3 Operation instruction for systems and component.
 - .4 Description of actions to be taken in event of equipment failure.
 - .5 Valves schedule and flow diagram.
 - .6 Colour coding chart.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .6 Approvals:
 - .1 Submit two (2) copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.

- .7 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.2 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Testing and Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.3 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 ACCESS HATCH

- .1 Type 304 Stainless steel, flush mounted, door and frame fully welded and gasketed, size as indicated on the Project Drawings.
- .2 Watertight: no leakage at 15.05 psf to ASTM E 331.
- .3 Air tight: no leakage at 15.05 psf - ASTM E 331.

PART 3 EXECUTION

3.1 CLEANING

- .1 Clean interior and exterior of all systems including strainers.

3.2 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Testing and Quality Control and submit report as described in PART 1 - SUBMITTALS.

- .2 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 Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.3 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.

3.4 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 22 05 00 Common Work Results for Plumbing.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM F876, ASTM F877 and ASTM F1960
- .2 Canadian Standards Association (CSA):
 - .1 CAN/CSA B137.5
- .3 National Sanitation Foundation (NSF):
 - .1 NSF/ANSI 14 and 61.
- .4 Underwriters' Laboratories of Canada Inc.:
 - .1 CAN/ULC-S101, CAN/ULC-S115 and CAN/ULC-S102.2
- .5 Manufacturer's Instructions:
 - .1 All manufacturer's plumbing design and installation handbooks, guides, bulletins and product submittals.

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 datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.

PART 2 PRODUCTS

2.1 PIPING

- .1 Provide PEX tubing, fittings, and fitting assemblies from a single

manufacturer throughout.

- .2 All PEX tubing, PEX rings, and PEX fittings from the same manufacturer must have been tested together and certified as a system
- .3 Tube Materials: Cross-linked polyethylene (PEX) manufactured by PEX-A or peroxide method.
 - .1 PEX tubing to ASTM F876 tested and approved for excessive temperature and pressure for 725 hours at 210 degrees F (99 degrees C) @ 150 psi (1035 kPa).
 - .2 PEX tubing to manufactured in accordance with ASTM F876, ASTM F877 and CAN/CSA-B137.5. The tube must be listed to ASTM by an independent third party agency.
 - .3 PEX tubing must be listed to both NSF/ANSI 14 and 61.
 - .4 PEX tubing must have Standard Grade hydrostatic design and pressure ratings of 200 F (82 degrees C) at 80 psi (551 kPa), 180 degrees F (82 degrees C) at 100 psi (689 kPa), and 73.4 degrees F (23 degrees C) at 160 psi (1102 kPa). Temperature and pressure ratings shall be issued by the Plastic Pipe Institute (PPI), a division of the Society of the Plastic Industry (SPI).
 - .5 Minimum bend radius for cold bending of the PEX tubing must not be less than six (6) times the outside diameter. Bends with a radius less than stated will require the use of a bend support as supplied by tube manufacturer.

2.2 FITTINGS

- .1 Make all connections to the PEX tubing to the requirements of ASTM F1960.
- .2 Fittings shall be manufactured of Engineered Polymers (EP). Lead free brass materials are allowed for transition fittings only.

2.3 JOINTS

- .1 Rubber gaskets, elastomeric, full face, hardness of 50 to 70 durometer.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy lead free for copper pipe.
- .4 Teflon tape: for threaded joints.
- .5 Solvent weld with primer to ASTM F493.
 - .1 Pressure rating 690 kPa at 82°C, 2760 kPa at 23°C.
- .6 PEX-A cold expansion ring and insert.

2.4 GATE VALVES

- .1 NPS2 and under, soldered:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body,

screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS2 and under, screwed:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.

2.5 BALL VALVES

.1 NPS2 and under:

- .1 Body and cap: cast high tensile bronze to ASTM B16 or ASTM B62.
- .2 Pressure rating: Class 125, 860 MPa steam.
- .3 Connections: Screwed ends to ANSI B1.20.1 and with hex. shoulders. Stem: tamperproof ball drive.
- .4 Stem packing nut: external to body.
- .5 Ball and seat: replaceable stainless steel or hard chrome, plated brass solid ball and Teflon seats.
- .6 Stem seal: TFE, EPDM, Nitrile, and Fluoroelastomer with external packing nut.
- .7 Operator: removable lever handle with extension for insulated pipe.
- .8 Cap and drain for drain service.

2.6 ACCESSORIES

- .1 Tubing Wall Penetration Brackets: Supply brackets designed for tubing wall membrane penetrations from the PEX tubing manufacturer.
- .2 Horizontal Pipe Support Channels: All horizontal pipe supports for PEX sizes 1" and greater must be galvanized steel channels and self-gripping and be supplied by the PEX tubing manufacturer.
- .3 Riser Clamps: PEX riser clamps must be epoxy coated.
- .4 Drain valves to be NPS ¾ gate valves with hose end male threads, cap and chain.

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 INSTALLATION

- .1 Install in accordance with NPC and 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.

- .4 Install the PEX potable water system in accordance with all manufacturer's plumbing design and installation handbooks, guides, bulletins and product submittals.
- .5 Use multi-port tees in-situ wherever possible instead of straight or reducing tee's to minimize pressure drops in the plumbing distribution system.
- .6 All fitting connections to the PEX tubing must be made to the requirements of ASTM F1960.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Install valves in accessible locations with stem above horizontal position unless otherwise indicated.
- .3 Install drain valves at low points in piping system.

3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

3.5 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that air chambers, expansion compensators are installed properly.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 22 05 00 Common Work Results for Plumbing.

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM C 564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70-12(R2016), Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125.3-12, Plumbing Fittings.

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 datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer 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 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent minimum NPS2, to: CAN/CSA-B70, with one layer of protective coating of bituminous.
 - .1 Joints.
 - .1 Mechanical joints.
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps.

- .2 Hub and spigot.
 - .1 Neoprene gasket: to CSA B70.
 - .2 Cold caulking compounds.

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 INSTALLATION

- .1 Install in accordance with National Plumbing Code and local authority having jurisdiction.

3.3 TESTING

- .1 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

- .1 Test to ensure traps are fully and permanently primed.
- .2 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .3 Affix applicable label (sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and 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 00 Common Work Results for Plumbing.

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM D 2235-04, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D 2564-04e1, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-Series B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS). QUALITY ASSURANCE

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 datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIAL

- .1 Maximum VOC limit 70 250 g/L to SCAQMD Rule 1168 GSES GS-36.

2.2 PIPING AND FITTINGS

- .1 For buried DWV piping to:
 - .1 CSA-B181.1.
 - .2 CSA-B181.2.
 - .3 CSA-B182.1.
- .2 For aboveground DWV piping for combustible construction to:
 - .1 CSA - B181.2

2.3 JOINTS

- .1 Solvent weld for PVC: to ASTM D 2564.
- .2 Solvent weld for ABS: to ASTM D 2235.

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 INSTALLATION

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance with National Plumbing Code Provincial Plumbing Code and local authority having jurisdiction.

3.3 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

- .1 Test to ensure traps are fully and permanently primed.
- .2 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .3 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CAN/CSA-C191-13, Series, Performance of Electric Storage Tank Water Heaters for Household Service.
 - .3 CAN/CSA-C309 M90(R2014), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled, installation procedures.

1.4 CLOSEOUT SUBMITTALS

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

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with Waste Reduction Work Plan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by the Departmental Representative.

1.6 WARRANTY

- .1 For the Work of this Section 22 30 05 - Domestic Water Heaters, warranty for five (5) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 GAS FIRED WATER HEATER

- .1 Provide gas-fired, condensing style water heater.
- .2 Performance: refer to equipment schedule on drawings.
- .3 Water heater(s) to have the CSA seal of certification and supplied with a factory installed CSA/ ASME rated temperature and pressure relief valve, and meet SCAQMD Rule 1146.2. Tank(s) to be of wet-base design and furnished heat exchange system with two-sided coating of high temperature porcelain enamel and furnished with magnesium anode rods rigidly supported. Water heater(s) to have 2" NPT front and rear water connections. Water heater(s) to meet or exceed thermal efficiency and standby loss requirements of ASHRAE. Tanks to have a working pressure of 150 psi and to be completely factory assembled, including a pressure regulator properly adjusted for operation on natural gas with a down- fired burner system. Water heater(s) shall certified for schedule IV venting with power vent and powered direct vent options. Water heater(s) must be covered by a three year limited tank warranty against tank leaks.
- .4 Provide sidewall or roof venting kits as required.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Vent heaters through the wall or roof as per the drawings and in accordance with the manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 22 05 00 Common Work Results for Plumbing.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-05, Plumbing Fittings.
 - .3 CAN/CSA-B651-04, Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: as indicated on drawings.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same

type.

PART 3 GENERAL

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 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to manufacturer's recommendations as indicated, measured from finished floor.
 - .2 Wall-hung fixtures: as indicated, measured from finished floor.
 - .3 Barrier free: to most stringent NBCC CAN/CSA B651.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
 - .3 Adjust flush valves to suit actual site conditions.
 - .4 Adjust urinal flush timing mechanisms.
 - .5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.
- .3 Checks:
 - .1 Water closets, urinals: flushing action.
 - .2 Aerators: operation, cleanliness.
 - .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

END OF SECTION