

PART 1 GENERAL

1.1 DESCRIPTION OF SYSTEMS

- .1 Provide complete plumbing system including:
 - .1 Sanitary waste, vent, storm, hot and cold water, trap primer water piping systems including fixtures, specialties and accessories.
 - .2 Provide NPS½ priming lines to floor drain traps as indicated.
 - .3 Do all work in accordance with the 2010 Canadian Plumbing Code and the local authorities having jurisdiction.
 - .4 All underground drains to be a minimum of NPS 2.
 - .5 Confirm that a minimum 50mm clearance is maintained between finished piping, including insulation.
 - .6 Provide piping sleeves for piping penetrating concrete floor slabs.

1.2 RELATED SECTIONS

- .1 Submittal Procedures: Section 01 33 00
- .2 Closeout Submittals: Section 01 78 00
- .3 Structural Steel: Section 05 12 23
- .4 Firestopping and Smoke Seals: Section 07 84 00
- .5 Painting: Section 09 91 00

1.3 FIXTURES AND FITTINGS

- .1 In case of discrepancy between Architectural and Mechanical drawings as to the number and location of fixtures, the Architectural drawings will govern.

1.4 RELATED WORK PERFORMED BY THIS SECTION

- .1 Caulking:
 - .1 Caulking is the responsibility of the appropriate Section of Division 07.
 - .2 Perform caulking in compliance with the requirements of Division 07.
- .2 Welding:
 - .1 All welding to be performed by Division 22 for all mechanical piping and structural supports and hangers.
 - .2 Perform welding by certified welders in accordance with the Provincial Labour Requirements and By-Laws of New Brunswick.

- .3 Cutting and Patching:
 - .1 Cut openings in concrete floors and walls and patch for mechanical work as required and as directed by the Departmental Representative.

1.5 FIXTURES AND FITTINGS

- .1 Equipment assemblies comprised of electro- mechanical components to be CSA approved where possible and bear the appropriate label. If the equipment in question is not CSA approved as an assembly, the manufacturer will arrange and pay for spot approval and labelling of the equipment prior to installation.

1.6 EQUIPMENT INSTALLATION

- .1 Provide unions and flanges to permit equipment maintenance and disassembly and to minimize disturbance to piping systems without interfering with other equipment.
- .2 Provide means of access for servicing equipment including permanently lubricated lifetime bearings.
- .3 Pipe equipment drains to floor drains.
- .4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

1.7 PIPE INSULATION

- .1 Pipe insulation to be as per Section 22 11 16.

1.8 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates as required.

1.9 TRIAL USAGE

- .1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.10 PROTECTION OF OPENINGS

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

1.11 EQUIPMENT SUPPORTS

- .1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Division 22.
- .2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of Section 05 12 23. Submit structural calculations with shop drawings.
- .3 Mount base mounted equipment on "Type B1" chamfered edge housekeeping pads, minimum of 100mm high and minimum 100mm larger than equipment dimensions all around. Concrete specified in a separate package.
- .4 Pipe hangers: specified in Division 23.

1.12 SLEEVES

- .1 Pipe sleeves:
 - .1 Through masonry, concrete or fire rated assemblies: nominal 0.912mm (20 ga.) galvanized steel.
 - .2 Through foundation walls: Schedule 40 steel pipe with annular in continuously welded at midpoint of wall.
 - .3 Provide 25mm clearance all around service piping or ducting for building settlement/ movement.
- .2 Terminate pipe sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25mm above other floors.
- .3 Fill voids around pipes:
 - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof, fire retardant, non- hardening mastic.
 - .2 Where sleeves pass through walls or floors, provide space for firestopping to maintain fire rating integrity.
 - .3 Where sleeves pass through interior walls not fire-rated, provide acoustic caulking.
 - .4 Ensure no contact between copper tube or pipe and ferrous sleeve.
 - .5 Fill future-use sleeves with lime plaster or other easily removable filler.
 - .6 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CAN/CGSB- 1.181.

1.13 PREPARATION FOR FIRESTOPPING

- .1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation: specified in Section 07 84 00.
- .2 Uninsulated unheated pipes not subject to movement: no special preparation.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe to move without damaging firestopping material.
- .4 Insulated pipes and ducts: cut back insulation at fire separation to allow proper firestopping.

- .5 Firestopping material for piping and duct penetrations by Section 07 84 00.

1.14 ESCUTCHEONS

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.

1.15 TESTS

- .1 Give 24 hour written notice of date for tests.
- .2 Insulate or conceal work only after testing and approval by Departmental Representative.
- .3 Conduct tests in presence of the Departmental Representative.
- .4 Bear costs including retesting.
- .5 Piping:
 - .1 General: maintain test pressure without loss for two (2) hours unless otherwise specified.
 - .2 Test drainage, waste and vent piping to the National Building Code, the Canadian Plumbing Code, and the authorities having jurisdiction.
 - .3 Test domestic hot, cold, and recirculation water piping at 1-1/2 times system operating pressure or minimum 862 kPa, whichever is greater.
- .6 Equipment: test as specified in relevant sections.
- .7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.16 PAINTING

- .1 Finish painting as specified in Section 09 91 00 except where specified elsewhere in Division 22.
- .2 Apply at least one (1) coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .3 Prime and touch up marred finished paintwork to match original.
- .4 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.17 SPARE PARTS

- .1 Furnish spare parts in accordance with Section 01 78 00 and as follows:
 - .1 One (1) set of packing for each pump.
 - .2 One (1) casing joint gasket for each size pump.
 - .3 Six (6) gaskets for plumbing cleanout plugs (each size).
 - .4 One (1) set of seats, washers, and o-rings for all flush valves, faucets, hose bibs, etc.
 - .5 Two (2) vandal-proof screw tools.
 - .6 And as specified elsewhere.

1.18 SPECIAL TOOLS

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00.

1.19 ACCESS DOORS

- .1 Supply access doors to concealed plumbing equipment for operating, inspecting, adjusting and servicing.
- .2 Flush mounted 600mm x 600mm for body entry and 300mm x 300mm for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Provide fire-rated access doors where penetrating fire-rated construction. Maintain fire rating integrity of construction.
- .3 Material:
 - .1 Special areas only such as tiled surfaces: use stainless steel with #4 satin finish.
 - .2 Remaining areas: use prime coated steel.
 - .3 Nominal 1.897mm (14 ga.) material.
- .4 Installation:
 - .1 Locate so concealed items are accessible.
 - .2 Locate so hand or body entry (as applicable) is achieved.
 - .3 Installation is specified in applicable sections.
- .5 Acceptable Manufacturers: Acudor, Buensod, LeHage, Zurn.

1.20 DIELECTRIC COUPLINGS

- .1 General:
 - .1 Compatible with and to suit pressure and temperature rating of piping system.
 - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes NPS 2 and under: isolating unions.
- .3 Pipes NPS 2-1/2 and over: isolating flanges.

- .4 Acceptable Manufacturers: EBCO, Walter Valiet Co., Watts.

1.21 DRAIN VALVES

- .1 Locate at low points and at section isolating valves unless otherwise specified.
- .2 Minimum NPS 3/4 unless otherwise specified: bronze, ball valve with hose end male thread, complete with cap and chain.
- .3 No water from any drain or relief valve shall discharge on the floor. Pipe drains to hub drains or funnel floor drains.

1.22 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 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.
- .2 Provide demonstrations and instructions in conjunction with the appropriate equipment manufacturer's representatives.
- .3 Use operation and maintenance manual, record drawings, audio visual aids, etc. as part of instruction materials.
- .4 Give instructions in maintenance and operating of the following equipment by factory trained personnel and for the time period specified. The time specified does not include the time for start-up of systems and equipment:
 - .1 Give instruction on the operation and maintenance of all mechanical components including but not limited to pumps, fixtures and domestic hot water system. The instruction period will be for a period of not less than two (2) working days. Review with instructors for an additional 90 days after the acceptance of the building by the Owner.
 - .2 Where more detailed instructions for some equipment or systems are called for in other sections of the specifications, those sections of the specifications will take precedence over this section.

1.23 OPERATION AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.
- .2 Have the operation and maintenance manual approved by and final copies deposited with Departmental Representative before final inspection.
- .3 Operation data to include:
 - .1 Description of each system and its controls.
 - .2 Operation instruction for each system and each component.
 - .3 Description of actions to be taken in event of equipment failure.

- .4 Valve schedule and flow diagram.
- .5 Colour coding chart; identification system.

- .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 data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 95.

- .6 Approvals:
 - .1 Submit three (3) copies of draft Operation and Maintenance Manual to the Departmental Representative for approval. Submission of individual data will not be accepted unless so directed by the Departmental Representative.
 - .2 Make changes as required and re-submit as directed by the Departmental Representative.

- .7 Additional data: Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.24 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.
- .2 Shop drawings and product data to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. (eg. access door swing spaces).
- .3 Shop drawings and product data to be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Points of operation on performance curves.
 - .3 Manufacturer to certify as to current model production.
 - .4 Certification of compliance to applicable codes.

1.25 CLEANING

- .1 Clean interior and exterior of all systems including strainers.
- .2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition.

1.26 RECORD DRAWINGS

- .1 Refer to Section 01 78 00.

1.27 WARRANTIES

- .1 Make good all defects other than normal wear and tear during the life of the warranty period. Warrant all work and installed equipment to operate quietly and satisfactorily and to accomplish the Work for which it was installed during the life of the warranty. At any time during this period, make any necessary changes and adjustments, or replacements, to accomplish this at no additional cost to the project.
- .2 Submit written extended Warranties in Maintenance Manual as specified in Section 01 78 00.

1.28 PERMITS AND REGULATIONS

- .1 Comply with all regulations and authorities having jurisdiction where applicable, including but not limited to the following:
 - .1 Department of Labour and Workforce Development.
 - .2 Fire Marshall.
 - .3 Plumbing Inspector.
 - .4 Provincial Board of Insurance Under-writers.
 - .5 National Building Code.
 - .6 Occupational Health & Safety Act.
 - .7 NFPA
- .2 Obtain and pay for any permits required by local codes and regulations and arrange for inspections applicable.
- .3 Any additional materials or labour required to conform to any of these rules and regulations will be furnished under the Contract with no additional cost to the project.

1.29 REFERENCE STANDARDS

- .1 Use the following latest editions and amendment of reference standards in effect on date of tender call:

ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AST	American Society of Testing & Materials
AWS	American Welding Society
AWWA	American Water Works Association
CEMA	Canadian Electrical Manufacturers Association
CGSB	Canadian Government Specification Board
CFUA	Canadian Fire Underwriters' Association
CHVAC	Canadian Heating, Ventilation & Air Conditioning Code (NCR) Fire Underwriters
CMB	Construction Materials Board
CSA	Canadian Standards Association
CUA	Canadian Underwriters Association
HRA	Heating, Refrigeration & Air Conditioning Institute of Canada
NBC	National Building Code of Canada
NBFU	National Board of Fire Underwriters'
NBS	National Bureau of Standards
NFPA	National Fire Protection Association
TIMA	Thermal Insulation Manufacturers Association
UL	Underwriters' Laboratories
ULC	Underwriters' Laboratories of Canada

1.30 ELECTRICAL

- .1 Electrical Work to conform to Division 26 including the following:
 - .1 Control wiring and conduit is specified in Division 26. Refer also to Division 26 and for wiring associated with control systems.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not applicable.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not applicable

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 21 05 01 - Mechanical General Requirements

1.2 REFERENCES

- .1 ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI B16.22-2015, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .4 ANSI B16.24-2011, Bronze Pipe Flanges and Fittings, Class 150 and 300.
- .5 ANSI/AWWA C111/A21.11-12, Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- .6 ASTM A183-14, Specification for Carbon Steel Track Bolts and Nuts.
- .7 ASTM A307-14, Specification for Carbon Steel Bolts and Studs, 414 MPa Tensile Strength.
- .8 ASTM B32-08(R2014), Specification for Solder Metal.
- .9 ASTM B75-11, Specification for Seamless Copper Tube.
- .10 ASTM B88M-14, Specification for Seamless Copper Water Tube (Metric).
- .11 MSS SP-70-2011, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .12 MSS SP-71-2011, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- .13 MSS SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.
- .2 Submit data for following: valves.

1.4 MAINTENANCE DATA

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

PART 2 - PRODUCTS

2.1 PIPING

- .1 Domestic Cold Water (DCW); Domestic Hot Water (DHW); Domestic Hot Water Recirculation (DHWR); Non-potable Water (NP), Trap Primer Piping (TP).
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried and embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints. "PEX", CSA approved potable water piping with no joints may be used under slab.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI B16.18. (Lead-free).
- .4 Wrought copper and copper alloy, solder type: to ANSI B16.22.
- .5 Piping NPS 2-1/2 and over: roll groove copper fittings to ASTM B75, alloy C12200. Victaulic "No-Sweat".
- .6 Mechanically formed Tee connections may be used on 25mm and above water pipe and where the branch line connection to the branch main is at least one pipe size smaller than the branch main.

2.3 JOINTS

- .1 Rubber gaskets, 3 mm thick: to ANSI/AWWA C111/A21.11.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder/brazing: tin-antimony 95-5: to ASTM B32, or tin-silver 94-6. (Lead free.)
- .4 Teflon tape: for threaded joints.
- .5 Piping NPS 2-1/2 and over: roll groove couplings with ductile or malleable iron housings, grade E EPDM flush seal gaskets and heat treated carbon steel bolts/nuts to ASTM A183. Victaulic "No- Sweat".

- .6 Dielectric unions between dissimilar metals to ASTM F492, complete with thermoplastic liner.

2.4 GATE VALVES

- .1 NPS 2-1/2 and over, flanged:
 - .1 Non-rising stem: to MSS SP-70, Class 125, 125 psig, full faced, flanged ends, cast-iron body, bronze trim, bolted bonnet.
 - .2 Acceptable Material: Crane 461, Jenkins 452; Kitz 72; Hattersley 501; Toyo 421A; Milwaukee Valve Company.

2.5 GLOBE VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS SP-80, Class 125, 862 kPa, bronze body, renewable composition disc, screwed over bonnet.
 - .2 Lockshield handles: as indicated.
 - .3 Acceptable Material: Crane 1310; Jenkins 106 BPJ; Kitz 10; Hattersley A51M; Toyo; Milwaukee Valve Company.
- .2 NPS 2 and under, screwed:
 - .1 To MSS SP-80, Class 125, 862 kPa, bronze body, screwed over bonnet, renewable composition disc.
 - .2 Lockshield handles: as indicated.
 - .3 Acceptable Material: Crane 14½ P; Jenkins; Kitz; Hattersley; Toyo; Milwaukee Valve Company.

2.6 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS SP-80, Class 125, 862 kPa, bronze body, bronze swing disc, screw in cap, re-grindable
 - .2 Acceptable Material: Crane 1342; Jenkins 4093; Hattersley A61SE; Toyo 237; Milwaukee Valve Company.
- .2 NPS 2 and under, screwed:
 - .1 To MSS SP-80, Class 125, 862 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
 - .2 Acceptable Material: Crane 37; Jenkins 4092; Hattersley A60AT; Toyo 236; Milwaukee Valve Company.
- .3 NPS 2-1/2 and over; flanged:
 - .1 To MSS SP-71, class 125, 862 kPa, cast iron body, flat flanges faces, renewable seat, bronze disc, bolted cap.
 - .2 Acceptable Material: Crane 373; Jenkins 587J; Hattersley A60AT; Toyo 236; Milwaukee Valve Company.

2.7 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 To ANSI B16.18, Class 150, 1034 kPa.
 - .2 Bronze body, stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon Buna N seat, steel lever handle.
 - .3 Acceptable Material: Crane Capri, Jenkins 901FJ Toyo 5044A, Kitz; Milwaukee Valve Company.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI B16.18, Class 150, 1034 kPa.
 - .2 Bronze body, chrome plated brass stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon Buna N seat, steel lever handle, with NPT to copper adaptors.
 - .3 Acceptable Material: Crane Capri, Jenkins 902FJ, Toyo 5049A, Milwaukee Valve Company; Kitz.
- .3 NPS 2-1/2 and over, roll groove:
 - .1 Bronze body, Class 150, 1034 kPa, with bronze trim, grade E EPDM coating bonded to ductile iron disc, enamelled two position detent handle.
 - .2 Acceptable Material: Victaulic series 608.

2.8 INSULATION

- .1 Insulation:
 - .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
 - .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 °C mean temperature when tested in accordance with ASTM C335.
 - .3 Rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/ULC-S702.
- .2 Insulation Securement:
 - .1 Tape: Self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.
 - .2 Contact adhesive: Quick setting.
 - .3 Canvas adhesive: Washable.
- .3 Vapour Retarder:
 - .1 Vapour retarder lap adhesive
 - .1 Water based, fire retardant type, compatible with insulation.
 - .2 Indoor vapour retarder finish
 - .1 Vinyl emulsion type acrylic, compatible with insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with the 2010 Canadian Plumbing Code and the local authority having jurisdiction.
- .2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.
- .3 Assemble all piping using fittings manufactured to ANSI standards.
- .4 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.
- .5 Connect to fixtures and equipment in accordance with manufacturer's instructions unless otherwise indicated.
- .6 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.
 - .3 Provide union nuts at all faucets. Do not directly solder faucets to supplies.
 - .4 Test piping systems in accordance with Section 21 05 01.

3.2 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves and as indicated. Ball valves shall be used for shut-off applications on piping up to and including NPS 2.

3.3 INSULATION

- .1 Apply materials in accordance with manufacturers instructions and this specification.
- .2 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .4 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 DISINFECTION

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction. After testing, provide acceptable water quality test report to the Departmental Representative for approval.

3.5 PRESSURE TESTS

- .1 Conform to requirements of Section 23 05 05.
- .2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

3.6 PRE-START-UP INSPECTIONS

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

3.7 START-UP

- .1 Timing: Start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .4 Monitor piping DHWS piping systems for freedom of movement, pipe expansion as designed.
 - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

- .1 Timing:
 - .1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify flow rate and pressure meet Design Criteria.
 - .2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .3 Sterilize DHWS systems for Legionella control.
 - .4 Verify performance of temperature controls.
 - .5 Verify compliance with safety and health requirements.

- .6 Check for proper operation of water hammer arrestors. Run one (1) outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .7 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.
- .3 Reports:
- .1 In accordance with Section 01 33 00 and 01 78 00.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Installation of Pipework: Section 23 05 05

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM B32-08(R2014), Specification for Solder Metal.
 - .2 ASTM B306-13, Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-14, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA B70-2012, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .2 CAN/CSAB125.3-12, Plumbing Fittings.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary storm and vent Type DWV to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA B125.
 - .2 Wrought copper: to CAN/CSA B125.
 - .2 Solder: tin-lead, 50:50, type 50A lead free, tin- 95:5, type TA, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary storm and vent minimum NPS 2, to: CAN/CSA-B70, with one (1) layer of protective coating of butimous.
 - .1 Joints.
 - .1 Mechanical joints.
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C 564 or CAN/CSA B70.
 - .2 Stainless steel clamps.
 - .2 Hub and spigot.

- .1 Neoprene gasket: to CSA B70.
- .2 Cold caulking compounds.
- .2 Above ground sanitary storm and vent: to CAN/CSA B70.
 - .1 Joints:
 - .1 Mechanical joints.
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints.
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 In accordance with Section 23 05 05.
- .2 Install in accordance with the 2010 Canadian Plumbing Code and local authority having jurisdiction.
- .3 Install piping parallel and close to walls to conserve headroom and space, and grade as indicated.
- .4 Wherever possible coordinate the exact location of underground drain pipes to avoid structural footings. Where drain pipes pass perpendicular to footings coordinate, prior to tender award, with the concrete and excavation contractor to ensure that the footings are stepped down to accommodate the pipes. Sleeve the pipes through the wall or grade beam just above the footing with a minimum of 25mm clear space around the pipe. Fill the clear space with soft insulation prior to back-fill.
- .5 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate fittings to line and grade (slope) as indicated. Backfill with minimum 150 mm of clean washed sand and upper 150mm of clean washed sand and upper 150 mm of rock free soil backfill.
- .6 Provide pipe firestop barriers and/or collars on the underside of fire-rated floors and both sides of fire-rated partitions that are penetrated.
 - .1 Acceptable material: 3M Firestop.
- .7 Install cast iron to CSA B70 for sanitary serving kitchen and boiler room.
- .8 Make provision for Rain Water Leader thermal expansion.

3.2 TESTING

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

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Make accessible and confirm access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to confirm traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Confirm weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Confirm that fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM D2235-04(R2011), Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 ASTM D2564-12, Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- .3 CSA B70-2012, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .4 CSA B1800-15, Plastic Nonpressure Piping Compendium.

1.2 HANDLING AND STORAGE

- .1 Handle and store pipe and fittings in such a manner as to avoid shock and damage. Do not use chains or cables passed through pipe bore.
- .2 Store gaskets in cool location, out of direct sunlight, and away from petroleum products.

1.3 APPLICATION

- .1 Buried sanitary and storm piping:
 - .1 PVC DWV with cast iron to CSA B70 on sanitary serving kitchens and boiler rooms.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS (DWV)

- .1 Pipe, fittings and solvent cement: Polyvinyl chloride to CSA B1800.
- .2 Solvent Weld to ASTM D2564.
- .3 Storm piping below grade: PVC-SDR 35.
- .4 Sanitary piping below grade: PVC-DWV.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Carefully inspect products for defects and remove defective products from site.
- .2 Confirm pipe and fittings are clean before installation.
- .3 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate fittings to line and grade (slope) as indicated. Backfill with minimum 150 mm of clean washed sand and upper 150 mm of rock free soil backfill.

3.2 INSTALLATION

- .1 Lay and join pipe and fittings as specified in this section and according to manufacturer's published instructions.
- .2 Start laying at outlet and proceed in upstream direction with bell ends of pipe facing upgrade.
- .3 Prevent entry of foreign material, water or other foreign matter into pipe. Use temporary watertight bulkheads when pipe laying is not in progress.
- .4 Install gaskets in accordance with manufacturer's published instructions. During cold weather store gaskets in heated area to assure flexibility.
- .5 Align pipe carefully before joining. Do not use excessive force to join pipe sections.
- .6 Support pipes as required to assure concentricity until joint is properly completed.
- .7 Keep pipe joints free from mud, silt, gravel or other foreign matter.
- .8 Avoid displacing gasket or contaminating with dirt, petroleum products, or other foreign material. Remove, clean, reinstall and lubricate gaskets so disturbed.
- .9 Where deflection at joint is permitted, deflect only after joint is completed. Do not exceed maximum joint deflection recommended by manufacturer.
- .10 Complete each joint before laying next length of pipe.
- .11 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations. Minimize deflection after joint has been made to avoid damage.

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 35 29 - Health and Safety Requirements.
- .4 Section 01 78 00 - Contract Closeout.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA):
 - .1 CAN/CSA-B45 Series, Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
 - .3 CAN/CSA-B651, Barrier-Free Design.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate, for all fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory set water consumption at recommended pressure.
 - .3 Minimum pressure required.
 - .4 Closeout Submittals:
 - .1 Submit maintenance data in accordance with Section 01 78 00.
 - .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing maintenance.
 - .3 List of recommended spare parts.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:

- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.
 - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

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: Architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one (1) location to be product of one (1) manufacturer and of same type.

2.2 EQUIPMENT SCHEDULE

- .1 Refer to plumbing fixture Schedule on the Drawings.

2.3 FIXTURE PIPING

- .1 Hot and cold water supplies to each fixture:
 - .1 Chrome plated flexible supply pipes each with screwdriver stop, reducers, escutcheon for exposed supplies.
- .2 Waste:
 - .1 Brass P trap with cleanout on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.

2.4 CHAIR CARRIERS

- .1 Factory manufactured floor- mounted carrier systems for all wall- mounted fixtures

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Wall-hung fixtures: as indicated, measured from finished floor.
 - .3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651, or Provincial Buildings Accessibility Act and Regulations.

3.2 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Do adjustments prior to pre-commissioning.
- .3 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .4 Checks:
 - .1 Aerators: operation, cleanliness.
 - .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .5 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION