

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Division 01 - General Requirements.

1.2 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 bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .4 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, PWGSC Representative before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .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.
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- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless directed by Engineer.
 - .2 Make changes as required and re-submit as directed by PWGSC Representative.

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

 - .8 Site Records:
 - .1 PWGSC will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.

 - .9 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 Engineer for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
 - .6 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Management System.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety.

1.4 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 – Closeout Submittals.
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- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Waste management and disposal to be in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 SLEEVES

- .1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.
 - .2 Schedule 40 steel pipe.
 - .3 Cast iron sleeves or steel sleeves with annular fin continuously welded at midpoint:
 - .1 Through foundation walls.
 - .2 Where sleeve extends above finished floor.
 - .4 Sizes: maximum 6mm (1/4") clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
 - .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25mm (1") above other floors. For equipment room floors, terminate 100mm (4") above floor and provide concrete curb.
 - .6 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. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
 - .3 Ensure no contact between copper tube or pipe and ferrous sleeve.
 - .4 Future-use sleeves shall be fire stopped as a blank opening listed system in order to provide the same fire rating as the assembly.
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- .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt.
- .6 One step cast-in-place sleeve and fire stop assemblies are an acceptable alternate to steel sleeving systems.
 - .1 Standard of Acceptance: Hilti CP680.

2.2 ACCESS DOORS

- .1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- .2 For drywall surfaces, access doors shall be flush type. For ceramic tile, wood, solid composite panels, or other surfaces other than drywall, access doors shall be recess type.
- .3 Flush mounted 750 x 750mm (30" x 30") for body entry and 300 x 300mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Access doors for reheat coils/VAV boxes above drywall ceilings shall be 750 x 750mm (30" x 30") minimum.
 - .1 Material:
 - .1 Prime coated steel.
 - .2 Standard of Acceptance: Acudor UF-5000
 - .1 Alternate: Mifab UA.
 - .4 Recessed, 300 x 300mm (12" x 12") minimum for hand entry unless otherwise noted. Recessed 16mm (5/8") door panel to allow insertion of various types of material. Outer frame as required to receive adjacent material. Concealed pivot rod hinge. Flush mounted, screwdriver operated cam latch.
 - .1 Use prime coated steel, with a primed white finish.
 - .2 Standard of Acceptance: mifab CAD-DW.
 - .1 Alternate: Acudor.
 - .5 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry is achieved.
 - .3 Installation by Division 09.
 - .6 Fire rated access panels: 16 ga. mounting frame, 20 ga. sandwich type insulated self-closing door with concealed hinge, 50mm thickness of fire rated insulation in door, self-latching ring pull latch, primer coated, 1½ hour rating.
 - .1 Standard of Acceptance: Acudor FW-5050
 - .2 Alternate: Mifab MPFR

- .7 Access doors must maintain fire rating if installed in a fire rated assembly. Refer to Architectural Drawings for location of fire rated walls and ceilings.

2.3 DIELECTRIC COUPLINGS

- .1 General:
- .1 To be compatible with and to suit pressure rating of piping system.
 - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes DN 50 (NPS 2) and under: isolating unions.
- .3 Pipes DN 65 (NPS 2 1/2) and over: isolating flanges

2.4 PREPARATION FOR FIRESTOPPING

- .1 All firestopping under this contract is to be carried out by a single sub-contractor. Refer to Section 07 84 00 for further applicable requirements.
- .2 When penetration element pass through a fire rated separation floor or wall; maintain fire rating integrity.
- .3 Provide free annular space according to the corresponding listed system to be used.
- .4 Apply fire stop material according to the installation procedure corresponding to the selected listed systems used.
- .5 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .6 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .7 Ensure no metal to metal contact where pipe passes through sleeve.
- .8 Always submit specific firestop details of all penetration types as a shop drawing for review by the Consultant prior to construction, showing approval number and installation details.
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- .9 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer; a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (February 2007).
- .10 A manufacturers' direct representative (not distributor or agent) to be on site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

2.5 FIRESTOP MATERIALS

- .1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirement and fire-rating involved for each separate instance.
- .2 Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors. The following products are acceptable:
 - .1 Hilti CP 680 Cast-In Place Firestop Device.
 - .2 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory).
- .3 The following products are acceptable for sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).
 - .1 Hilti FS-ONE Intumescent Firestop Sealant.
 - .2 Hilti CP 604 Self Leveling Firestop Sealant.
 - .3 Hilti CP 620 Fire Foam.
 - .4 3M Fire Stop Sealant 2000.
 - .5 3M Fire Barrier CP25 WB.
 - .6 Tremco Tremstop Fyre-Sil Sealant.
 - .7 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.
- .4 Sealants or caulking materials for use with sheet metal ducts:
 - .1 Hilti CP 601s Elastomeric Firestop Sealant.
 - .2 Hilti CP 606 Flexible Firestop Sealant.
 - .3 Hilti FS-ONE Intumescent Firestop Sealant.
 - .4 Hilti CP 604 Self Leveling Firestop Sealant.

- .5 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .5 Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant.
 - .2 Hilti CP 620 Fire Foam.
 - .3 3M Fire Barrier CP25 WB.
 - .4 Tremco Tremstop WBM Intumescent Firestop Sealant.
 - .5 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .6 Intumescent sealant, caulking or putty materials for use with flexible cable or cable bundles:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant.
 - .2 Hilti CP 618 Firestop Putty Stick.
 - .3 Hilti CP 620 Fire Foam.
 - .4 3M Fire Barrier CP25 WB.
 - .5 Tremco Tremstop WBM Intumescent Firestop Sealant.
 - .6 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .7 Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles.
 - .1 Hilti CP 618 Firestop Putty Stick.
 - .2 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .8 Wall opening protective materials for use with U.L.C. listed metallic and specified nonmetallic outlet boxes:
 - .1 Hilti CP 617 Firestop Putty Pad.
 - .2 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .9 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems) tested to 0.20" differential:
 - .1 Hilti CP 642 Firestop Collar.
 - .2 Hilti CP 643 Firestop Collar.
 - .3 Hilti CP 645 Wrap Strips.
 - .4 3M Fire Barrier PPD Plastic Pipe Device.
 - .5 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.
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- .10 Materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways:
 - .1 Hilti FS 635 Trowelable Firestop Compound.
 - .2 Hilti FS 657 FIREBLOCK.
 - .3 Hilti CP 620 Fire Foam.
 - .4 3M Firestop Foam 2001.
 - .5 3M Fire Barrier CS-195 Composite Sheet.
 - .6 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .11 Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways:
 - .1 Hilti FS 657 FIREBLOCK.
 - .2 Equivalent products listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

2.6 ACCEPTABLE FIRE STOP MANUFACTURERS

- .1 Submit to compliance with through penetration firestop systems listed in U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory, provide products of the following manufacturers as identified below:
 - .1 Hilti (Canada) Limited.
 - .2 Tremco Sealants & Coatings.
 - .3 3M Fire Protection Products.
 - .4 Other manufacturers listed in the U.L.C. Fire Resistance Directory - Volume III or UL Products Certified for Canada (cUL) Directory.

 - .2 Firestop Field Quality Control
 - .1 Examine sealed penetration areas with both visual inspection combined with a small proportion of destructible test (destructible tests consist of removing the fire stop material on a small surface to ensure the proper thickness of fire stop material and proper thickness/compression of backing material plus verification of all limitations of listed system used to fire stop penetration) to ensure proper installation before concealing or enclosing areas.
 - .2 Keep areas of work accessible until inspection by authorities having jurisdiction.
 - .3 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
 - .4 Install a warning card that is clearly visible adjacent to all large and medium openings that may be re-penetrated. This card should contain
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the following information:

- .1 Warning that the opening has been fire stop protected.
 - .2 Indicate the fire stop system used (ULC or cUL).
 - .3 F rating FT rating.
 - .4 Fire stop product(s) used.
- .3 Person to contact and phone number in case of modification or new penetration of fire stop system.

2.7 ESCUTCHEONS

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas. On pipes passing through millwork and cabinetry.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws. Use cast iron type in equipment rooms.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.
- .5 Do not use split-type escutcheon plates.
- .6 Secure to pipe on finished surface but not insulation.

PART 3 - EXECUTION

3.1 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.2 FIELD QUALITY CONTROL

- .1 Site Tests: conduct tests in accordance with Section 01 45 00 – Quality Management
- .2 Provide 7 days written notice to PWGSC.

3.3 DEMONSTRATION

- .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 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction material.
- .3 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

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section includes specifications for all piping insulation requirements.

1.2 RELATED SECTIONS

- .1 Division 01 – General Requirements
- .2 Section 22 11 18 – Domestic Water Piping Copper.
- .3 Section 22 13 17 – Drainage Waste and Vent Piping – Cast Iron, Copper
- .4 Section 22 05 05 – Installation of Pipework.
- .5 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.
- .6 Section 23 21 15 – Hydronic Systems: Copper.
- .7 Section 23 21 16 – Hydronic Systems: Steel.

1.3 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-2013 (SI Edition), Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI Approved; IESNA Co-sponsored).
 - .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - .2 ASTM C335-10ae1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-05, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449-07, Standard Specification for Mineral Fiber-Hydraulic- Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-07, Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C534/C534M-08, Standard Specification for Preformed Flexible Cellular Thermal Insulation in Sheet and Tubular Form.
 - .7 ASTM C547-07e1, Specification for Mineral Fibre Pipe Insulation.
 - .8 ASTM C553-08, Specification for Mineral Fibre Blanket Insulation for Commercial and Industrial Applications.
 - .9 ASTM C612-04e1, Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .10 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .11 ASTM C921-09, Standard Specification for Determining the Properties of Jacketing Materials for Thermal Insulation.
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- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.12-M86, Cement, Thermal Insulating and Finishing.
 - .2 CGSB 51-GP-52MA-89, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .3 CAN/CGSB-51.53-95, Poly (Vinyl Chloride)Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.
- .4 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S702-09, Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC S702.2-10, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

1.6 INSTALLATION INSTRUCTIONS

- .1 Submit manufacturer's installation instructions in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.7 QUALIFICATIONS

- .1 Installer to be specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
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- .2 Protect from weather, construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions required by manufacturer.

1.9 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces provided the mechanical service is not visible from floor level.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Waste management and disposal to be in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre as specified herein 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 TIAC Code A-1: Rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Maximum "k" factor: to ASTM C547.
 - .4 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52 Ma.
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- .3 Maximum "k" factor: to ASTM C547.
- .5 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52 Ma.
 - .3 Maximum "k" factor: to ASTM C547.
- .6 TIAC Code A.6: Flexible unicellular tubular elastomer.
 - .1 Insulation: to ASTM C534 with vapour retarder jacket.
 - .2 Jacket: to CGSB 51-GP-52 Ma.
 - .3 Maximum "k" factor: to ASTM C534.
 - .4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.
- .7 TIAC Code A.2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
 - .1 Insulation: to ASTM C533.
 - .2 Maximum "k" factor: to ASTM C533.
 - .3 Design to permit periodic removal and re-installation.

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.
- .2 Contact adhesive: quick-setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 To CAN/CGSB-51.12.
 - .2 Hydraulic setting or Air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

- .1 Water-based, fire-retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
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2.7 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.8 JACKETS

- .1 Jacketing on Pipe Insulation:
 - .1 Glass fibre reinforced kraft foil laminate, all service jacket is acceptable for concealed spaces.
 - .2 Where not in concealed spaces, pipe Insulation shall be canvas jacketed. Canvas Jackets shall be ULC listed and labeled, fire retardant treated, applied with an approved lagging adhesive (two coats) and painted with a fire retardant paint with a flame spread rating not greater than 25 and a smoke developed classification of not higher than 50. Minimum canvas weight shall be 6.5 oz/sq. yd.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

- .1 Caulking: to Section 07 92 00 – Joint Sealing.
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PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.
- .2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

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

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Provide removable pre-fabricated insulation pads c/w jacket for valves over 2", 3-way control valves, strainers, suction diffusers, triple duty valves, heads of domestic water heater tube bundles, backflow preventers, water meters, domestic water PRVs, domestic cold water pumps.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry at all times. Overlaps to manufacturer's instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
 - .2 TIAC Code: A-1.
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- .1 Securements: Tape @ 300 mm oc.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.

 - .3 TIAC Code: A-3.
 - .1 Securements: Tape @ 300 mm oc.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.

 - .4 TIAC Code: A-6.
 - .1 Insulation securements: SS wire.
 - .2 Seals: lap seal adhesive, lagging adhesive.

 - .5 TIAC Code: C-2 with vapour retarder jacket.
 - .1 Insulation securements: Tape @ 300 mm oc.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.

 - .6 TIAC Code: A-2.
 - .1 Insulation securements: SS bands.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501-H.

 - .7 Thickness of insulation to be as listed in following table.
 - .1 ** Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 ** Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.
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Application	Temp °C	TIAC code	Pipe sizes(NPS) and insulation Run to thickness (mm)						
			out	1	1 1/4	2	2 1/2	4	5 6
Hot Water Heating	60 - 94	A-1	25	38	38	38	38	38	38
Hot Water Heating	up to 59	A-1	25	25	25	25	38	38	
Domestic HW and Domestic HW Recirc		A-1	25	25	25	38	38	38	
Domestic CW with vapour retarder		A-3	25	25	25	25	25	25	
Condensate Return		A-1	25	38	38	38	38	38	
RWL and Storm with vapour retarder		A-3	25	25	25	25	25	25	
Refrigerant hot gas liquid suction	4 - 13	A-6	25	25	25	25	25	25	

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section includes specifications for all piping, valves and fittings for domestic water system.

1.2 RELATED SECTIONS

- .1 Division 01 - General Requirements.
- .2 Section 22 05 00 - Common Work Results for Plumbing.
- .3 Section 22 07 20 - Thermal Insulation for Piping.
- .4 Section 22 42 01 - Plumbing Specialties and Accessories.
- .5 Section 23 05 05 - Installation of Pipework.
- .6 Section 23 05 22 - Valves - Bronze.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
 - .1 ANSI/ASME B16.15-2006, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-2001(R2005), Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-2001(R2005), Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-2006, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 600, 900, 1500 and 2500.
 - .2 American Society for Testing and Materials (ASTM International).
 - .1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - .2 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube (Metric)
 - .3 American Water Works Association (AWWA).
 - .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - .2 AWWA C651-05, Disinfecting Water Mains.
 - .4 Canadian Standards Association (CSA International).
 - .1 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.
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- .5 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-2002a, Butterfly Valves.
 - .2 MSS-SP-70-2006, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction.
 - .1 NRCC 47688, National Plumbing Code of Canada - 2005.
- .9 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992, c.
1 TDGA).

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit product data for following:
 - .1 Piping.
 - .2 Joints and fittings.
 - .3 Strainers.
 - .4 Valves.
 - .3 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
-

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Waste management and disposal to be in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems within building.
 - .1 Above ground: copper tube, hard drawn, type K: to ASTM B88M.
 - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

- .1 All fittings must be lead free as per California Code 116875/Vermont Bill S.152.
- .2 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .3 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .4 Cast copper, solder type: to ANSI/ASME B16.18.
- .5 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .6 NPS 2 and larger: roll grooved to CSA B242.
- .7 Cast copper alloy flared joint type: to ANSI B16.26.

2.3 JOINTS

- .1 Rubber gaskets, latex-free, 1.6 mm thick: to ANSI/AWWA C11/A21.11.
 - .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
 - .3 Solder: silver. Brazing: lead-free (less than 0.2% lead).
 - .4 Teflon tape: for threaded joints.
 - .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
-

- .1 Acceptable manufacturers: Victaulic, Epc, Watts.
- .6 Dielectric connections between dissimilar metals: dielectric fitting complete with thermoplastic liner.
 - .1 Acceptable manufacturers: Victaulic, Epc, Watts.

2.4 GATE VALVES

- .1 All fittings must be lead free as per California Code 116875/Vermont Bill S.152.
- .2 NPS 2 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 22 - Valves - Bronze.
 - .2 Acceptable material: Crane 1700S, Jenkins 8135, Kitz 44.
- .3 NPS 2 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 22 - Valves - Bronze.
 - .2 Acceptable material: Crane 428, Jenkins 810J, Kitz 24.
- .4 NPS 2-1/2 and over, in mechanical rooms, flanged:
 - .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim.
 - .2 Acceptable material: Crane 465½, Jenkins 454, Kitz 72.
- .5 NPS 2-1/2 and over, other than mechanical rooms, flanged:
 - .1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet.
 - .2 Acceptable material: Crane 461, Jenkins 452J, Kitz 75.

2.5 GLOBE VALVES

- .1 All fittings must be lead free as per California Code 116875/Vermont Bill S.152.
 - .2 NPS 2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet.
 - .2 Lockshield handles: as indicated.
 - .3 Acceptable material: Crane 1310, Jenkins 106 BP, Kitz 10.
 - .3 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc.
 - .2 Lockshield handles: as indicated.
 - .3 Acceptable material: Crane 7TF, Jenkins 106 BJ, Kitz 9.
-

2.6 SWING CHECK VALVES

- .1 All fittings must be lead free as per California Code 116875/Vermont Bill S.152.
- .2 NPS 2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
 - .2 Acceptable material: Crane 1707S, Jenkins 997, Kitz 14.
- .3 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
 - .2 Acceptable material: Crane 1707, Jenkins 996, Kitz 4.
- .4 NPS 2-1/2 and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap specified Section 23 05 23 - Valves - Cast Iron.
 - .2 Acceptable material: Crane 373, Jenkins 587J, Kitz 78.

2.7 BALL VALVES

- .1 All fittings must be lead free as per California Code 116875/Vermont Bill S.152
- .2 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified.
 - .3 Acceptable material: Crane 9203B, Jenkins 201-J, Kitz 68.
- .3 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors.
 - .3 Acceptable material: Crane 9323B, Jenkins 202J, Kitz 69.

2.8 CIRCUIT BALANCING VALVES

- .1 All fittings must be lead free as per California Code 116875/Vermont Bill S.152
 - .2 General
 - .1 Y style globe valve, designed to provide precise flow measurement and control, with valved ports connected to differential pressure.
 - .3 Accuracy:
 - .1 Readout to be within plus or minus 2% of actual flow at design flow rate.
-

- .4 Pressure die-cast dezincification resistant copper alloy construction, 1.7 MPa, 121°C, screwed ends, EPDM "O" ring seal, screw-in bonnet.
 - .1 Flow control: at least four (4) full turns of handwheel with digital handwheel and tamperproof concealed mechanical memory.
- .5 Insulation:
 - .1 Use prefabricated shipping packaging of 5.4 R polyurethane as insulation.
- .6 Drain connection:
 - .1 NPS 3/4 valved and capped, suitable for hose socket.
- .7 Acceptable material: Armstrong CBV, Tour & Anderson STA, Victaulic.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada, Provincial Plumbing Code and local authority having jurisdiction.
- .2 Install pipe work in accordance with Section 23 05 05 – Installation of pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install cold water piping below and away from hot water, recirculation and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures in accordance with manufacturer's written instructions unless otherwise indicated. Connect to equipment in accordance with approved manufacturer's shop drawings and as per manufacturer's written instructions.
- .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.

3.2 VALVES

- .1 Isolate equipment, fixtures and branches with valves.
- .2 Install circuit balancing valves on recirculation systems as indicated on drawings. Balance recirculation systems using circuit balancing valves to flows as indicated on drawings. Mark settings and record on as-built drawings on completion

3.3 PRESSURE TESTS

- .1 Test pressure: greater of 1½ times maximum system operating pressure or 860 kPa.

3.4 FLUSHING AND CLEANING

- .1 Flush out, disinfect and rinse system to AWWA C651-05 - Disinfecting Water Mains and the approval of PWGSC Representative.
- .2 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Provincial potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing.
- .3 Submit flushing and cleaning procedure for approval in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Coordinate with Section 33 11 16 - Site Water Utility Distribution Piping.
- .5 Upon completion, provide laboratory test reports on water quality for Engineer approval.

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.

3.6 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 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .4 Check control, limit, safety devices for normal and safe operation.
-

- .4 Rectify start-up deficiencies.

3.7 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 that flow rate and pressure meet Design Criteria.
 - .2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterilize HWS and HWC systems for Legionella control.
 - .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.
 - .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor. Repeat for outlets and flush valves.
 - .8 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 91 15 – Commissioning.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.8 OPERATION REQUIREMENTS

- .1 Operational requirements:
 - .1 Cleaning materials and schedules.
 - .2 Repair and maintenance materials and instructions.

END

PART 1 – GENERAL

1.1 SECTION INCLUDES

- .1 This section includes specifications for all piping and fittings for drainage systems (cast iron and copper option).

1.2 RELATED SECTIONS

- .1 Division 01 - General Requirements.
- .2 Section 22 05 00 - Common Work Results for Plumbing.
- .3 Section 22 07 20 - Thermal Insulation for Piping.
- .4 Section 23 05 05 - Installation of Pipework.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM International).
 - .1 ASTM B32-08, Specification for Solder Metal.
 - .2 ASTM B306-09, Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-09a, 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 B70-06, Cast Iron Soil Pipe, Fittings, and Means of Joining.
 - .3 CAN/CSA-B125.1-05, Plumbing Supply Fittings.
 - .4 CSA B242-05, Groove- and Shoulder-Type Mechanical Pipe Couplings.
 - .3 National Research Council (NRC)/Institute for Research in Construction.
 - .1 NRCC 47688, National Plumbing Code of Canada – 2010.
-

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- .1 Aboveground sanitary, storm, vent and indirect drains from mechanical equipment up to NPS 4, Type DWV to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.1.
 - .2 Wrought copper: to CAN/CSA-B125.1.
 - .2 Solder: to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent, minimum NPS 3, to: CAN/CSA-B70, with one layer of protective coating.
 - .1 Joints.
 - .1 Mechanical joints.
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps.
- .2 Aboveground sanitary, storm, and vent: to CAN/CSA-B70.
 - .1 Joints.
 - .1 Mechanical joints.
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.
 - .2 Groove and shoulder type couplings for cast iron complete with neoprene rubber gaskets and stainless steel bolts and nuts: to CSA B242.
 - .3 Compound elastomeric couplings complete with stainless steel or cast iron clamps: to CGSB-77-GP-2M, installed to manufacturer's recommendations.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
 - .2 Install in accordance with National Plumbing Code of Canada and local authority having jurisdiction.
 - .3 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 150 mm of clean washed sand.
 - .4 Install above ground piping parallel and close to walls and ceilings to conserve headroom
-

and space, and to grade as indicated.

- .5 For threaded joints, use teflon tape applied to male thread only.

3.2 TESTING

- .1 Pressure test sanitary, vent and rain water leader piping in accordance with the National Plumbing Code of Canada.
 - .1 Pressure test buried systems before backfilling in accordance with the National Plumbing Code of Canada.
 - .2 Hydraulically test to verify grades and freedom from obstructions.
 - .3 Pressure test systems (with air or water) in accordance with the National Plumbing Code of Canada.
 - .4 Final test systems (with air or smoke) to a pressure of 25 mm water column in accordance with the National Plumbing Code of Canada.
 - .5 Test durations: minimum 1 hour for water systems; 2 hours for air systems.

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that 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 ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Verify provisions for movement of roof system.
- .4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

3.4 VERIFICATION

- .1 Verification requirements in accordance with Section 01 47 17
-

- Sustainable Requirements: Contractor's Verification.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section includes:
 - .1 Specifications for all piping and fittings for drainage systems (PVC).
 - .2 Sustainable requirements for verification.

1.2 RELATED SECTIONS

- .1 Division 01 - General Requirements.
- .2 Section 22 05 00 - Common Work Results for Plumbing.
- .3 Section 23 05 05 - Installation of Pipework.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM International).
 - .1 ASTM D2235-04, Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D2564-04(2009)e1, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA-Series B1800-06, Plastic Nonpressure Pipe Compendium.
 - .2 CSA-B181.2-06, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
 - .3 CSA-B182.1-06, Plastic Drain and Sewer Pipe and Pipe Fittings.
- .3 National Research Council (NRC)/Institute for Research in Construction.
 - .1 NRCC 47688, National Plumbing Code of Canada - 2010.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Waste management and disposal to be in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
-

PART 2 – PRODUCTS

2.1 PIPING AND FITTINGS

- .1 For buried and or above ground sanitary, storm and vent piping to:
 - .1 CSA-B181.1.
 - .2 CSA-B181.2.
 - .3 CSA-B182.1.
 - .4 Aboveground piping to meet the following:
 - .1 Flame spread rating: less than 25.
 - .2 Smoke development rating: less than 50.

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 TESTING

- .1 Pressure test buried systems before backfilling in accordance with the National Plumbing Code of Canada.
 - .2 Hydraulically test to verify grades and freedom from obstructions.
-

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Verify provisions for movement of roof system.
- .4 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .5 Use only cast iron piping in mechanical room and kitchens.

END

PART 1- GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 22 05 00 - Common Work Results For Plumbing.
- .2 Section 22 07 20 - Thermal Insulation For Piping
- .3 Section 22 11 18 - Domestic Water Piping Copper

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B51-03, Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CAN/CSA C22.2 No.110, Construction and Test of Electric Storage Tank Water Heaters.

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 domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.
 - .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance and engineering data 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, labelled with manufacturer's name, address.
-

1.6 WARRANTY

- .1 For the Work of this Section 22 30 05 - Commercial Water Heaters, 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to number of years specified for each product.

PART 2 - PRODUCTS

2.1 COMPONENTS

- .1 Sustainable Requirements:
 - .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.2 ELECTRIC WATER HEATER

- .1 To CAN/CSA C22.2 No.110, CAN/CSA-C191 with 6 immersion type elements, 5,000 W each, and surface mounted or immersion type adjustable thermostats.
- .2 Tank: 450 L, double coated porcelain enamel steel jacket, 768 mm diameter x 1718 mm high, 50 mm polyurethane foam insulation, 3 year warranty against leaks certificate.

2.3 TRIM AND INSTRUMENTATION

- .1 Drain valve: NPS 1 with hose end.
- .2 Thermometer: 100 mm dial type with red pointer and thermowell filled with conductive paste.
- .3 Pressure gauge: 75 mm dial type with red pointer, syphon, and shut-off cock.
- .4 Thermowell filled with conductive paste for control valve temperature sensor.
- .5 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over funnel floor drain and visible to operators.
- .6 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

2.4 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation in existing concrete support pad in accordance with Section 05 50 00 - Metal fabrications.
-

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 manufacturer's recommendations and authority having jurisdiction.

3.3 FIELD QUALITY CONTROL

- .1 Commissioning of the new hot water tank shall be completed in the presence of the PWGSC commissioning agent.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section – 22 05 00 - Common Work Results For Plumbing
- .2 Section – 22 11 18 - Domestic Water Piping Copper
- .3 Section – 22 13 17 - Drainage Waste and Vent Piping Cast Iron-Copper
- .4 Section – 22 13 18 - Drainage Waste And Vent Piping-Plastic
- .5 Section – 22 30 05 - Domestic Water Heaters
- .6 Section – 22 42 03 - Commercial Plumbing Fixtures
- .7 Section - 22 47 00 - Drinking Fountains

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A 126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .2 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C701, Standard for Cold Water Meters-Turbine Type for Customer Service.
 - .3 ANSI/AWWA C702, Standard for Cold Water Meters-Compound Type.
 - .3 CSA International
 - .1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.
 - .4 Plumbing and Drainage Institute (PDI)
 - .1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
 - .2 PDI-WH201, Water Hammer Arresters Standard.
-

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with contractor's representative and Departmental Representative and Consultant to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. Indicate VOC's:
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories for submitted equipment.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
-

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2- PRODUCTS

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Type 1: Heavy duty; cast iron body, round head, sediment basket, Cast Iron strainer, Trap Seal Primer connection, integral seepage pan, and clamping collar.
- .3 Type 2: Medium duty; cast iron body, round head, sediment basket, Cast Iron strainer, Vandal Proof Secure Top, Trap Seal Primer connection, integral seepage pan, and clamping collar.
- .4 Type 3: Combination Funnel Floor Drain; 100 mm diameter funnel, cast iron body, round head, sediment basket, Cast Iron strainer, Vandal Proof Secure Top, Trap Seal Primer connection, integral seepage pan, and clamping collar.
- .5 Trench Drain 1: Acid resistant epoxy coated trench drain, presloped, modular, with Class E ductile iron grate, inside domed strainer, anchor flanges, membrane clamps.

2.2 ROOF DRAINS

- .1 Type 1: controlled flow; 380 mm diameter, cast iron body, under deck clamp and sump receiver to suit roof construction, flashing clamp ring with integral gravel stop, bearing pan, flow control weir assembly, polyethylene dome.

2.3 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
 - .2 Access Covers:
 - .1 Wall Access: face or wall type, polished nickel bronze or stainless steel round
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- cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
- .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: cast iron round gasket, vandal-proof screws.
 - .3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.
 - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
 - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.4 NON-FREEZE WALL HYDRANTS

- .1 Recessed type with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Chrome plated finish.

2.5 WATER HAMMER ARRESTORS

- .1 Stainless steel construction, piston type: to PDI-WH201.

2.6 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application as indicated, reduced pressure principle type back flow preventer.

2.7 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.

2.8 TRAP SEAL PRIMERS

- .1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection.

2.9 STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
 - .2 NPS 2 and under, bronze body, screwed ends, with brass cap.
 - .3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.
-

2.10 OIL INTERCEPTORS

- .1 Oil interceptor, single basin, 6mm polyethylene tank, heavy duty dura coated frame, complete with non-skid heavy duty cover, flush with floor, suitably vented, trap seal primer.
- .2 Depth: 915 mm. Invert depth based on sanitary line, typical depth to be 78 mm. Capacity:590 L based on 78 mm invert depth.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.3 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada, provincial codes, and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
 - .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
-

- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.5 NON-FREEZE WALL HYDRANTS

- .1 Install 600 mm above finished grade.

3.6 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures.

3.7 BACK FLOW PREVENTERS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .1
- .2 Pipe discharge to terminate over nearest drain or service sink.

3.8 TRAP SEAL PRIMERS

- .1 Install for all floor drains, trench drains, and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Departmental Representative or Consultant.
- .3 Install soft copper or plastic tubing to floor drain.

3.9 STRAINERS

- .1 Install with sufficient room to remove basket for maintenance.

3.10 OIL INTERCEPTORS

- .1 Install with sufficient space, as indicated, for maintenance.

3.11 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: General Requirements, supplemented as specified herein.
 - .2 Timing: start-up only 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.
- .3 Provide continuous supervision during start-up.

3.12 TESTING AND ADJUSTING

- .1 General:
 - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified.
 - .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
 - .3 Application tolerances:
 - .1 Pressure at fixtures: +/- 70 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
 - .4 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
 - .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
 - .6 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
 - .7 Roof drains:
 - .1 Check location at low points in roof.
 - .2 Check security, removability of dome.
 - .3 Adjust weirs to suit actual roof slopes, meet requirements of design.
 - .4 Clean out sumps.
 - .5 Verify provisions for movement of roof systems.
 - .8 Access doors:
 - .1 Verify size and location relative to items to be accessed.
-

- .9 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .10 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .11 Wall, ground hydrants:
 - .1 Verify complete drainage, freeze protection.
 - .2 Verify operation of vacuum breakers.
- .12 Pressure regulators, PRV assemblies:
 - .1 Adjust settings to suit locations, flow rates, pressure conditions.
- .13 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .14 Hydronic system water Make-up Assembly:
 - .1 Verify flow, pressure, and connection.
- .15 Soap Dispensing Systems:
 - .1 Verify location and reach.
 - .2 Check for leaks.

3.13 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 PROTECTION

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

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 22 05 00 - Common Work Results For Plumbing.
- .2 Section 22 11 18 - Domestic Water Piping Copper
- .3 Section 22 42 01 - Plumbing Specialties And Accessories

1.2 REFERENCES

- .1 CSA Group
 - .1 CAN/CSA-B45 Series, Plumbing Fixtures, (Consists of B45.0, B45.1, B45.2, B45.3, B45.4, B45.5, B45.6, B45.7, B45.8 and B45.9).
 - .2 CSA B125.3, Plumbing Fittings.
 - .3 CSA B651, Accessible Design for the Built Environment.
- .2 Green Seal (GS)
 - .1 GS-36, Adhesives for Commercial Use.
- .3 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for washroom fixtures and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory-set water consumption per flush at recommended pressure.
 - .3 For water closets, urinals: minimum pressure required for flushing.

1.4 CLOSEOUT SUBMITTALS

- .1 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
-

- .2 Details of operation, servicing, maintenance.
- .2 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2- PRODUCTS

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
 - .2 Trim, fittings: manufacture in accordance with CSA B125.3.
 - .3 Exposed plumbing brass to be chrome plated.
 - .4 Number, locations: as indicated.
 - .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.
 - .7 Water closets:
WC-1: wall-mounted, exposed flush valve, top spud ultra-low flush, maximum 4.8 litres/flush.
 - .1 Bowl: vitreous china, syphon jet, elongated rim, open front seat
 - .2 Barrier Free Mounting with seat height mounted at 430 mm
 - .8 Electronic Water Closet Flush Valves:
 - .1 Barrier-free, stainless steel or Polished Chrome, electronic, sensor proximity type, activated by [infra-red].
 - .2 Sensor: waterproof, with impact-resistant, anti scratch coated plastic lens, sensitivity adjustable from 100 mm to 450 mm.
 - .3 Controls: interchangeable receptacles for stainless steel sheathed sensor and
-

- modular plug-type solenoid connections, hardwired, slow-closing commercial solenoid for 860 kPa, 85 degrees C.
 - .4 Transformer: 120/24 VCA, Class 2, UL and CSA listed, hardwire type, sized for up to 8 solenoids.
 - .5 Equipped with manual override button.
 - .9 Water Closet Seats.
 - .1 Seat: white, elongated, open front, moulded solid plastic, stainless steel check hinges.
 - .10 Urinals:
 - .1 U-1: wall mounted, ultra-low flush, exposed flush valve, top spud.
 - .1 Urinal: vitreous china, washout type, integral flushing rim, extended shields, integral trap, removable stainless steel strainer, back outlet.
 - .2 Lower rim Mounting height of 610 mm.
 - .2 U-2: wall mounted, ultra-low flush, exposed flush valve, top spud.
 - .1 Urinal: vitreous china, washout type, integral flushing rim, extended shields, integral trap, removable stainless steel strainer, back outlet.
 - .2 Lower rim Mounting height of 430 mm.
 - .11 Urinal Electronic Flush Valves:
 - .1 Surface mounted, controlled by infra-red.
 - .1 Complete with removable filter, 9 second time delay, flush time adjustable from 0-8 seconds, factory set at 4.5 seconds, 0.5 L flush/cycle maximum.
 - .2 Sensor adjustable from 50-1220 mm, factory set to 860 mm.
 - .3 Solenoid valve: hardwired slow-closing type for 60 kPa (minimum), 1000 kPa (maximum), 85 degrees C with manual over-ride, adjustable flow control.
 - .4 Transformer: 120/ 24 VAC Class 2, UL and CSA listed, hardwire type.
 - .12 Washroom Lavatories:
 - .1 L-1: Semi Countertop, Barrier Free:
 - .1 Vitreous china, recessed self draining deck, single supply opening, overflow. Size: 560 x 550 mm.
 - .2 L-2: wall-hung, barrier Free.
 - .1 Vitreous china, low shelf, with integral back, contoured front, shallow front basin, front overflow, single supply opening, concealed supports. Sizes: [550 x 460] mm.
 - .13 Washroom Lavatory Electronic Trim:
 - .1 Barrier-free electronic faucet:
 - .1 Infra-red motion sensor activated by hand motion in lavatory.
 - .2 Sensor: waterproof, incorporated in body of unit, with impact-resistant plastic lens and anti-scratch coating, inside neck, sensitivity adjustable from 100 mm to 450 mm.
-

- .3 Water conservation: 30 second maximum run time.
 - .4 Controls: vandal-proof, interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, hardwired slow-closing commercial solenoid[s] for 860 kPa, 85 degrees C.
 - .5 Transformer: 120/ 24 VAC Class 2, UL and CSA listed, hard wire type, sized for up to 8 solenoids.
 - .6 Spout: Chrome plated, with integral flow control aerator rated at 1.9 l/minute at 413 kPa maximum.
 - .7 Under-counter temperatures mixing controls.
- .14 Fixture piping:
- .1 Hot and cold water supplies to fixtures:
 - .1 Chrome plated flexible supply pipes with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on fixtures not having integral trap.
 - .2 Chrome plated in exposed places.
 - .3 Insulation:
 - .1 Insulate Hot water and Waste lines as per CSA B651 requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to manufacturer's recommendations, or as indicated, measured from finished floor.
 - .2 Wall-hung fixtures: as indicated, measured from finished floor.
 - .3 Barrier-free: to most stringent NBC or 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 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section – 22 05 00 - Common Work Results For Plumbing
- .2 Section – 22 11 18 - Domestic Water Piping Copper

1.2 REFERENCES

- .1 Air-Conditioning and Refrigeration Institute (ARI)
 - .1 ARI 1010, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series, CSA Standards on Plumbing Fixtures.
 - .2 CAN/CSA-B125.3, Plumbing Fittings.
 - .3 CAN/CSA-B651, Accessible Design for the Built Environment.

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 fountains and coolers, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.
 - .2 Indicate, for all fixtures:
 - .3 Dimensions, construction details, roughing-in dimensions.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.
 - .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .2 List of recommended spare parts.
-

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, labelled with manufacturer's name, address.

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 Refrigerated water coolers:
 - .1 WF-1: fully recessed.
 - .1 Refrigeration system: packaged hermetic R134a unit with pre-cooler, air-cooled condenser, thermostatically controlled.
 - .2 Capacity: 2.1 L/h from 27 degrees C to 10 degrees C, with 32 degrees C ambient air. In accordance with ARI 1010.
 - .3 Cabinet: type 302 stainless steel, satin finish, integral back, strainer, access panel and grille, elevated bubbler base.
 - .4 Bubbler: pushbutton operated, self-regulating, angle stream, squirt-proof, with nozzle and guard.
 - .5 Integrated Bottle Filler.
 - .6 Dual Level, Barrier Free unit.
 - .7 Electrical: grounded electrical cord with plug: 120 V, 60 Hz. CSA certified.
- .6 Fixture piping:
 - .1 Cold water supplies to each fixture:
 - .1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with cleanout on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.

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 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.
- .2 Drinking fountains:
 - .1 In accordance with ARI 1010.

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 water cooler, drinking fountain flow stream to ensure no spillage.
- .3 Checks:
 - .1 Refrigerated water coolers: operation, temperature settings.
- .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.
 - .1 Move surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
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END
