PART 1 GENERAL

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings; submit drawings stamped and signed for review by Departmental Representative.

.3 Shop drawings to indicate:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.4 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.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by Departmental 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.
  - .6 Valves schedule and flow diagram.
  - .7 Colour coding chart.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.6 Approvals:

.1 Submit draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted.

.2 Make changes as required and re-submit as directed by Departmental 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 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of testing finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Departmental Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing f using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals and as indicated in Sections.

.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.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

PART 2 PRODUCTS

2.1 MATERIALS

.1 All materials used on this project shall be new and CSA approved unless noted otherwise.

PART 3 EXECUTION

3.1 PAINTING, REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests as specified in other sections of this specification.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION

.1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Contractor to supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

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

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Departmental Representative may record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American National Standards Institute (ANSI)

.1 ANSI Z358.1 Emergency eyewash and shower equipment.

.3 Canadian Standards Association (CSA)

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.

.2 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Health Canada/Workplace Hazardous Materials Information Systems (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 Plumbing and Drainage Institute (PDI)

.1 PDI-WH201, Water Hammer Arresters Standard.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Submit WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements. Indicate VOC's for adhesive and solvents during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.

.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 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals. Include:

.1 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.3 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging materials in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Owner's Representative.

.5 Fold up metal and plastic banding flatten and place in designated area for recycling.

1.5 WARRANTY

.1 Provide a written guarantee, signed and issued in the name of the owner, against defective materials and workmanship for a period of one (1) year from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 FUNNEL DRAIN WITH"P" TRAP

.1 Bronze body combination funnel and trap drain, complete with Bronze bottom clean-out plug, pipe size 50 mm, funnel 102 mm wide x 96 mm high.

2.2 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.

2.3 WATER HAMMER ARRESTORS

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

2.4 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.5 HEAVY DUTY SPRING RETRACTABLE REELS

.1 Acceptable material: REELCRAFT model D83075 or approved equal meeting specifications noted below.

.2 All-steel construction

.3 Baked-on powder coat finish, corrosion-resistant

.4 Ball-bearing style swivel

.5 Guide arm is field adjustable for wall or ceiling mounting positions.

.6 Weight: 46.3

.7 Hose I.D.: 19 mm

.8 Hose O.D.: 27.3 mm

.9 Hose Length: 22860 mm

.10 Pressure: 1724 kPa

.11 Hose End: 19 mm NPT(M)

.12 Inlet: 19 mm NPT(F)

.13 Reel Outlet: 19 mm NPT(F)

.14 Hose Included Yes

.15 Max Temperature (°CF)40.5

2.6 HOSE REEL MIXING VALVE

.1 Acceptable material: Streamline Mix Master Model MM3000BVTG or approved equal meeting specifications noted below.

.2 Hot and Cold Water Mixing Station,

.3 Bronze Construction,

.4 Stainless Steel Temperature Gauge,

.5 Wall Mounted

.6 Bronze Ball Valve-Style Control Valves

.7 In-Line Check Valves

.8 Sani-Mount Wall Bracket,

.9 Stainless Steel Hardware

.10 Hot and cold Inlet: 19 mm NPT

.11 Outlet: 19 mm NPT

2.7 COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH UNIT (BARRIER FREE) - EXISTING

.1 Identification sign: 355 mm x 90 mm sign for wall mounting. Sign to read "**EMERGENCY DRENCH SHOWER/EYEWASH UNIT**".

.2 Location: as indicated.

2.8 EMERGENCY EYEWASH AND COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH THERMOSTATIC MIXING VALVE

.1 To ANSI Z358.1.

.2 Liquid-filled thermal motor and piston control mechanism with positive shut-off of hot water when cold water supply is lost to prevent scalding.

.3 Valve shall allow cold water flow in the event of loss or interruption of the hot water supply or thermostatic failure.

.4 Vandal-resistant temperature adjustment.

.5 Rough bronze finish.

.6 Temperature range: 18ºC to 35ºC.

.7 Accuracy: ±1.67ºC.

.8 Maximum operating pressure: 860 kPa.

.9 Maximum inlet temperature: 82ºC.

.10 Provide complete with dial thermometer.

.11 Check stops on inlet of hot/cold.

.12 Provide complete with 18 gauge surface mounted stainless steel enclosure. Dimension of enclosure to be 610 mm high x 578 mm wide x 165 mm deep.

.13 Capacity: 98.5 L/min at 310 kPa differential pressure with a cold flow bypass capacity of 50.0 L/min at 310 kPa differential pressure.

.14 Application: emergency fixtures as indicated.

2.9 PIPE WALL AND FLOOR PENETRATION SEAL

.1 Application:

.1 Pipes penetrating exterior concrete walls below grade and concrete floors on grade.

.2 Seal material to be EPDM.

.3 Pressure plates to be glass-reinforced plastic.

.4 Bolts and nuts to be stainless steel 18-8.

.5 Suitable temperature range to be -40ºC to 121ºC.

.6 Wall sleeves to be Schedule 40 black iron pipe. Sleeves in exterior walls to be galvanized.

.7 Floor sleeves to be Schedule 40 black iron pipe.

.8 Wall and floor sleeves to be sufficiently long to mount flush with interior and exterior walls and flush with finished floor of slab-on-grade floors, 50 mm above floor, for floors above grade.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.

.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 NPS4.

3.4 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.5 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.6 START-UP AND COMMISSIONING

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.2 Timing: Start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.7 TESTING AND ADJUSTING

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.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 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.6 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.7 Wall, Ground hydrants:

.1 Verify complete drainage, freeze protection.

.2 Verify operation of vacuum breakers.

.8 Pressure regulators, PRV assemblies:

.1 Adjust settings to suit locations, flow rates, pressure conditions.

.9 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

.10 Grease interceptors:

.1 Activate, using manufacturer's recommended procedures and materials.

.11 Tempered water assemblies:

.1 Verify operation of Hi/Lo tempered water assemblies at both high and low flow conditions.

.2 Verify proper discharge temperature setpoint for all tempered water assemblies including those serving emergency fixtures.

.12 Commissioning Reports:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.13 Training:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.2 Demonstrate full compliance with Design Criteria.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers International (ASME)

- .1 ANSI/ASME B16.15-13, Cast Cooper Alloy Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18-12, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-13, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24-11, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
- .5 ASME B16.26-13, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .6 ASME B31.9-14, Building Services Piping.
- .7 ASME B36.19M-04, Stainless Steel Pipe.

.2 ASTM International

- .1 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM B42-15a, Seamless Copper Tube, Standard Sizes.
- .3 ASTM B88M-14, Standard Specification for Seamless Copper Water Tube (Metric).
- .4 ASTM F876-15, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
- .5 ASTM F877-11, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.

.3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)

- .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 ANSI/AWWA C151/A21.51-09, Ductile Iron Pipe, Centrifugally Cast, for Water.
- .3 AWWA C904-06, Crosslinked Polyethylene (PEX) Pressure Pipe, ½ In. (12 mm) through 3 In. (76mm), for Water Service.

.4 CSA Group

- .1 CSA B137.5-13, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
- .2 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Underwriters Laboratories of Canada (ULC)

- .1 CAN/ULC S101-07, Fire Endurance Tests of Buildings Construction and Materials.

.2 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

.3 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop.

.6 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-02a, Butterfly Valves.

.2 MSS-SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71-05, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.9 National Research Council (NRC)

.1 National Plumbing Code of Canada (NPC) 2015.

.10 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data

.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse by manufacturer and return of padding, pallets, crates packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.4 Materials and Resources Construction Waste Management: Divert 50% from Landfill and Construction Waste Management: Divert 75% From Landfill. Construction Waste Management plan 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:

.1 Copper tube, hard drawn, type L, to ASTM B88M.

.2 Buried or embedded:

.1 Copper tube, soft annealed, type L: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 300 150: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 250 125: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger:

.1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

.6 NPS 1 ½ and smaller:

.1 Wrought copper to ANSI/ASME B16.22 cast copper to ANSI/ASME B16.18 ; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

.1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

.7 NPS 1 ½ and smaller: PEX fittings to CSA B137.5.

.8 NPS 2 and larger: PEX fittings to CSA B137.5 and ASTM F1960. Elbows, adapters, couplings, plugs, tees, multi-port tees and valves.

2.4 SWING CHECK VALVES

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 21 13.01 - Hydronic Systems: Copper.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 21 13.01 - Hydronic Systems: Copper.

2.5 BALL VALVES

.1 NPS 2 and under, screwed:

.1 Class 150.

.2 Bronze body, stainless steel chrome plated brass ball, PTFE adjustable packing, brass gland and Bunan PTFE TFE seat, steel lever handle as specified Section 23 21 13.01 - Hydronic Systems: Copper.

2.6 PROTECTIVE CONDUIT

.1 Not Used.

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 local authority having jurisdiction NPC Province Territory Plumbing Code and as specified herein.

.2 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.

.3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.5 Valves

.1 Isolate equipment, fixtures and branches with ball valves.

3.3 PRESSURE TESTS

.1 Test pressure: greater of 1 time maximum system operating pressure.

3.4 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Provincial, Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

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 pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.6 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction approval of Departmental Representative.

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

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 HWS and HWC 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 Scheduling:

.1 Verify system performance after pressure and leakage tests and disinfection are 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 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.3 Sterilize HWS and HWC 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 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, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports and schematics, using report forms as specified in Section 01 91 33 - Commissioning Forms.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.9 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Not Used.

1.2 REFERENCE STANDARDS

.1 ASTM International Inc.

.1 ASTM B32-08, Standard Specification for Solder Metal.

.2 ASTM B306-02, Standard Specification for Copper Drainage Tube (DWV).

.3 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canada Green Building Council (CaGBC)

.1 Not Used.

.3 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-B125.3-05, Plumbing Fittings.

.4 Green Seal Environmental Standards (GSES)

.1 Standard GS-36-00, Commercial Adhesives.

.5 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015 (NPC).

.6 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse by manufacturer and return of pallets padding, crates, packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary and vent Type DWV to: ASTM B306.

.2 NPS 1-1/4 – NPS 2

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.3.

.2 Wrought copper: to CAN/CSA-B125.3.

.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 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 CAN/CSA-B70.ASTM C564 or

.2 Stainless steel clamps.

.2 Hub and spigot:

.1 Caulking lead: to CSA B67.

.2 Cold caulking compounds.

.2 Above ground sanitary and vent: to CAN/CSA-B70.

.1 Joints:

.1 Hub and spigot:

.1 Caulking lead: to CSA B67.

.2 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

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

3.3 TESTING

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

3.4 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 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sanitary, vent, pump discharge etc.) c/w directional arrows every 4.5 m (whichever is less).

3.5 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No.110-94 (R2004), Construction and Test of Electric Storage Tank Water Heaters.

.3 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015 (NPC).

1.2 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 Submit drawings stamped and signed by professional engineer registered or licensed in Territory, Province, Canada.

.2 Indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of padding, crates, packaging materials, pallets in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 ELECTRIC WATER HEATER

.1 To CAN/CSA C22.2 No.110, CAN/CSA-C191.1.

.2 Capacity: 454 litres.

.3 Size: 1586 mm high x 718mm jacket diameter.

.4 Automatic thermostat controls: surface mount thermostat with high energy cut-off and manual reset for safety.

.5 Direct heat transfer with immersed element.

.6 Steel tank: foamed, rolled and welded. coated with a high temperature porcelain enamel

.7 Insulation: 63 mm rigid polyurethane foam

.8 Water connection: 19mm NPT factory installed dielectric fittings.

.9 Certified at test pressure 2068 kPa and working pressure 1034 kPa.

.10 Protective magnesium anode rod.

.11 T and P relief valve.

.12 Electrical: single phase 208V with 3000W elements non-simultaneous wiring.

.13 Three year model.

2.2 WATER HEATER DRAIN PAN

.1 Aluminum or galvanized steel.

.2 Minimum 800mm diameter by 100mm deep.

.3 Premanufactured or custom fabricated to suit hot water heater.

.4 32mm dain fitting

2.3 CUSTOM FABRICATED STAND

.1 Galvanized steel strut channel system fabricated to suit hot water tank weight and drain pan.

.2 Material

.1 Structural grade steel

.1 ASTM A1011 SS GR33

.2 Hot-Dip Galvanized

.1 ASTM A1046 Material & A1059

.3 Frame shall be designed by a qualified engineer licensed to practice in the Province of Manitoba. Contractor is to submit sealed shop drawings indicating material thicknesses and grades, and details of structure to meet the weight of the tank and accessories.

2.4 ANCHOR BOLTS AND TEMPLATES

.1 Size anchor bolts to withstand seismic zone 4 acceleration and velocity forces.

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 authority having jurisdiction and.

.2 Provide structural steel for instantaneous heaters.

.3 Provide insulation between tank and supports.

3.3 CLEANING

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

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION