

**Part 1 General**

**1.1 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 mechanical equipment 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 Province of New Brunswick, Canada.
  - .2 Indicate on drawings:
    - .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.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for mechanical equipment for incorporation into manual.
  - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2 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.
  - .3 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.
- .4 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.
  - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .5 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
  - .1 Departmental Representative 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. 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 waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .8 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

**1.3 MAINTENANCE MATERIAL SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**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 installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative 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.

**3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.3 SYSTEM CLEANING**

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

**3.4 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 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.

**3.5 DEMONSTRATION**

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

**3.6 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:
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.7 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 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for plumbing pumps.

**1.2 REFERENCES**

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet for equipment.
- .3 Shop Drawings.
  - .1 Submit shop drawings to indicate:
    - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
    - .2 Wiring and schematic diagrams.
    - .3 Dimensions and recommended installation.
    - .4 Pump performance and efficiency curves.
- .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 Manufacturers name, type, model year, capacity and serial number.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list with names and addresses.

**1.4 QUALITY ASSURANCE**

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

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:

- .1 Separate waste materials for recycling in accordance with Section 01 74 22 – 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 material 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 Departmental Representative.
- .5 Unused sealant materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 DOMESTIC HOT WATER CIRCULATING PUMPS**

- .1 Capacity: 0.82 L/s against total differential head of 43.34 kPa.
- .2 Construction: Casing (Volute): Stainless Steel. Stator Housing: Steel Cartridge: Stainless Steel. Impeller: Non-Metallic. Shaft: Ceramic. Bearings: Carbon. O-Ring & Gaskets: EPDM.
- .3 Motor: 30 W, 115V-1ph-60Hz, direct drive motor, drip-proof, with thermal overload protection.
- .4 Supports: provide as recommended by manufacturer.

## **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 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.

### **3.3 FIELD QUALITY CONTROL**

- .1 Site Tests/Inspection:
  - .1 Check power supply.
  - .2 Check starter protective devices.

- .2 Start-up, check for proper and safe operation.
- .3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

### **3.4 START-UP**

- .1 General:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
  - .2 Procedures:
    - .1 Check power supply.
    - .2 Check starter O/L heater sizes.
    - .3 Start pumps, check impeller rotation.
    - .4 Check for safe and proper operation.
    - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
    - .6 Test operation of hands-on-auto switch.
    - .7 Run-in pumps for 12 continuous hours.
    - .8 Check installation, operation of mechanical seals. Adjust as necessary.
    - .9 Adjust alignment of piping and conduit to ensure full flexibility.
    - .10 Eliminate causes of cavitation, flashing, air entrainment.
    - .11 Measure pressure drop across strainer when clean and with flow rates as finally set.

### **3.5 REPORTS**

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: reports, supplemented as specified.
- .2 Include:
  - .1 PV results on approved PV Report Forms.
  - .2 Product Information report forms.
  - .3 Pump performance curves (family of curves) with final point of actual performance.

### **3.6 TRAINING**

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O M Personnel, supplemented as specified.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15-13, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.22-13, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International Inc.
  - .1 ASTM A536-84 (2014), Standard Specification for Ductile Iron Castings.
  - .2 ASTM B88M-13, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
  - .1 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .6 National Research Council (NRC)/Institute for Research in Construction
  - .1 NRCC 38728, National Plumbing Code of Canada (NPC) - 1995.
- .7 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 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

**Part 2 Products**

**2.1 PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground: copper tube, hard drawn, type L: 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 Cast copper threaded fittings, Class 125: to ANSI/ASME B16.15.
- .2 Cast copper, solder type: to ANSI/ASME B16.18.
- .3 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .4 NPS 1 and smaller: wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; with 301stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

**2.3 JOINTS**

- .1 Solder: 95/5 tin copper alloy.
- .2 Teflon tape: for threaded joints.
- .3 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

**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 05 23.01 - Valves - Bronze.

**2.5 BALL VALVES**

- .1 NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 Forged Brass body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.

**2.6 CIRCUIT BALANCING VALVES**

- .1 NPS 2 and under, screwed:

- .1 Class 150. Forged Brass body, 'Y' pattern, equal percentage globe-style and provide three functions:
  - .1 Precise flow measurement,
  - .2 Precision flow balancing,
  - .3 Positive drip-tight shut-off.
- .2 Multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Minimum of five full 360° handwheel turns. Handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.
- .3 Precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi shall have two, 6mm threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves shall be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug shall be brass. The handwheel shall be high-strength resin.

### **Part 3 Execution**

#### **3.1 APPLICATION**

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

#### **3.2 INSTALLATION**

- .1 Install in accordance with NPC, local authority having jurisdiction in the Province of New Brunswick.
- .2 Assemble piping using fittings manufactured to ANSI 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 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.

#### **3.3 VALVES**

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

#### **3.4 PRESSURE TESTS**

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

### **3.5 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 to Provincial potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

### **3.6 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.

### **3.7 DISINFECTION**

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction or Departmental Representative.
- .2 Coordinate with Section 33 11 16.01 - Incoming Site Water Utility Distribution Piping.
- .3 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

### **3.8 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.
- .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, and safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

### **3.9 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 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 or re-charge air chambers. Repeat for outlets and flush valves.
  - .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
- .1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

### **3.10 CLEANING**

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

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International Inc.
  - .1 ASTM D2235-04 (2011), Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  - .2 ASTM D2564-12, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-Series B1800-12, Thermoplastic Non-Pressure Pipe Compendium - B1800 Series.
  - .2 CAN/ULC 102.2 -10 - Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
- .3 Green Seal Environmental Standards (GSES)
  - .1 Standard GS-36-00, Commercial Adhesives.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**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 piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Store at temperatures and conditions recommended by manufacturer.

**Part 2 Products**

**2.1 SANITARY AND STORM**

- .1 For buried and/or above ground storm piping to:
  - .1 For buried or above ground application in concealed areas where ceiling is not used as plenum space; PVC to CSA-B181.2.
  - .2 For aboveground applications in exposed or plenum spaces; PVC to CSA-B181.2, fire rated.

## **2.2 MATERIAL**

- .1 Adhesives and Sealants: in accordance with Section 07 92 00 - Joint Sealants.
  - .1 Maximum VOC limit 70 g/L GSES GS-36.

## **2.3 VENT PIPING AND FITTINGS**

- .1 For buried and above ground DWV piping to:
  - .1 CAN/CSA B1800.

## **2.4 JOINTS**

- .1 Solvent weld for ABS: to ASTM D2235.

## **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 most stringent of the National Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

### **3.3 TESTING**

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

### **3.4 PERFORMANCE VERIFICATION**

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

### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for piping, fittings, equipment used in compressed air systems.

**1.2 REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.
    - .1 BPVC-VIII.1 - 2017, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1.
    - .2 BPVC-VIII.2 - 2017, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 2 - Alternative Rules.
    - .3 BPVC-VIII.3 - 2017, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels.
  - .2 ASME B16.5-2017, Pipe Flanges and Flanged Fittings.
  - .3 ASME B16.11-2016, Forged Fittings, Socket-Welding and Threaded.
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A181/A181M-14, Standard Specification for Carbon Steel Forgings for General Purpose Piping.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 ACTION AND INFORMATIONAL 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 piping, fittings and equipment.
- .3 Shop Drawings:
  - .1 Submit shop drawings to indicate project layout including layout, dimensions and extent of piping system.
    - .1 Vertical and horizontal piping locations and elevations and connections details.
    - .2 Other details including: air compressor system.

- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .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.

## **1.4 QUALITY ASSURANCE**

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

## **Part 2 Products**

### **2.1 AIR COMPRESSOR**

- .1 General: Rotary screw compressor system as indicated.

### **2.2 AIR RECEIVER**

- .1 As indicated.

### **2.3 REFRIGERATED AIR DRYER**

- .1 As indicated.

### **2.4 COMBINATION FILTER-REGULATOR**

- .1 As indicated.

### **2.5 PIPING**

- .1 Piping: to ASTM A53/A53M, schedule 80 seamless black steel.
- .2 Fittings:
  - .1 NPS 2 and smaller: to ASME B16.11, schedule 80 steel, socket welded.
  - .3 Couplings: to ASME B16.11, socket welded or threaded half coupling type.
  - .4 Unions: 1000 kPa malleable iron with brass-to-iron ground seat.
  - .5 Dissimilar metal junctions: use dielectric unions.
- .6 Flanges:
  - .1 NPS 2 and smaller: to ASME B16.5, forged steel, raised face and socket welded.
  - .2 NPS 2 1/2 and larger: to ASME B16.5, forged steel, raised face and slip-on or weld neck.

- .7 Joints:
  - .1 NPS 2 and smaller: socket welded.

## **2.6 BALL VALVES**

- .1 Three-piece design or top entry for ease of in-line maintenance.
  - .1 To ASTM A181/A181M, Class 70, carbon steel body socket welded ends, carbon steel ball and associated trim suitable for compressed air application.
  - .2 To withstand 1034 kPa maximum pressure.

## **2.7 COUPLERS/CONNECTORS**

- .1 Industrial interchange series, full-bore.
- .2 Maximum inlet pressure: 1700 kPa.
- .3 Valve seat: moulded nylon.
- .4 Body: zinc plated steel.
- .5 Threads: NPT.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 COMPRESSOR STATION**

- .1 Install on vibration isolators on housekeeping pad as indicated.

### **3.3 REFRIGERATED AIR DRYER**

- .1 Install on three-valve bypass.
- .2 Install tee connection after dryer for emergency connection to instrument control air system.

### **3.4 COMPRESSED AIR LINE FILTER**

- .1 Install on discharge line from refrigerated air dryer.

### **3.5 MAIN AIR PRESSURE REGULATORS**

- .1 Install at air compressor station.
- .2 Install additional regulators on connections to equipment as required.

### **3.6 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION**

- .1 Install flexible connection in accordance with Section 23 05 16 – Expansion Fittings and Loops for HVAC Piping.

- .2 Install shut-off valves at outlets, major branch lines and in locations as indicated.
- .3 Install quick-coupler chucks and pressure gauges on drop pipes.
- .4 Install unions to permit removal or replacement of equipment.
- .5 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.
- .6 Grade piping at 1% slope minimum.
- .7 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.
- .8 Make branch connections from top of main.
- .9 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.
- .10 Provide drain from refrigerated air dryer.
- .11 Weld steel piping in accordance with Section 23 05 17 – Pipe Welding and;
  - .1 To ASME code and requirements of authority having jurisdiction.
  - .2 Weld concealed and inaccessible piping regardless of size.

### **3.7 FIELD QUALITY CONTROL**

- .1 Site Tests/Inspection:
  - .1 Testing: pressure test in accordance with requirements of Section 22 05 00 – Common Work Results for Plumbing, for 4 h minimum, to 1100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa.
- .2 Manufacturer's Field Services:
  - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.
  - .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 at stages listed:
    - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
    - .2 Twice during progress of work at 25% and 60% complete.
    - .3 Upon completion of Work, after cleaning is carried out.
- .3 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

### **3.8 CLEANING**

- .1 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

- .2 Check entire installation is approved by authority having jurisdiction.
- .3 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
- .4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)
  - .1 ANSI Z21.10.3-2017/CSA 4.3-2017, Gas Water Heaters - Volume III - Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous.
- .2 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B149.1-15, Natural Gas and Propane Installation Code.
  - .2 CAN/CSA-B149.2-15, Propane Storage and Handling Code.

**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 Provide drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, 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 materials to site in original factory packaging, labelled with manufacturer's name, address.

**1.5 WARRANTY**

- .1 For the Work of this Section 22 30 05 - Domestic 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.

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**Part 2 Products**

**2.1 PROPANE WATER HEATER**

- .1 Propane gas water heater, minimum 95% thermal efficiency, 450 L storage capacity, 146 KW input rating, recovery rating as indicated at 62°C rise and a maximum hydrostatic working pressure of 1103 kPa.
- .2 Water heater(s) shall:
  - .1 Modulating gas burner that automatically adjusts the input based on demand.
  - .2 Powered anodes that are non-sacrificial and maintenance free.
  - .3 Seamless glass-lined steel tank construction, with glass lining applied to all waterside surfaces after the tank has been assembled and welded;
  - .4 Meets the thermal efficiency and/or standby loss requirements of ASHRAE/IES 90.1;
  - .5 Foam insulation.
  - .6 CSA Certified and ASME rated T&P relief valve;
  - .7 Down-fired power burner designed for precise mixing of air and gas for optimum efficiency, requiring no special calibration on start-up;
  - .8 Approved for 0" clearance to combustibles.
- .3 The control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout.
- .4 Standard Power Venting using a 150mm diameter PVC pipe for a maximum distance of 35 meters equivalent of vent piping.

**2.2 TRIM AND INSTRUMENTATION**

- .1 Drain valve: NPS 1 with hose end.
- .2 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.
- .3 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

**2.3 ANCHOR BOLTS AND TEMPLATES**

- .1 Supply anchor bolts and templates for installation in concrete support pad in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 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 and authority having jurisdiction.

**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**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A126-04(20014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2 ASTM B62-15, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA)
  - .1 ANSI/AWWA C700-15, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
- .3 CSA International
  - .1 CSA-B64 Series-11 (R2016), Backflow Preventers and Vacuum Breakers.
  - .2 CSA B79-08 (R2013), Commercial and Residential Drains and Cleanouts.
- .4 Plumbing and Drainage Institute (PDI)
  - .1 PDI-WH201-R2010, Water Hammer Arresters Standard.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings:
  - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with contractor's representative
  - .2 In accordance with Section 01 14 10 – Scheduling and Management of Work to:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building construction sub trades.
    - .4 Review manufacturer's written installation instructions and warranty requirements.

**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 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 - Health and Safety Requirements 01 35 43 - Environmental Procedures. Indicate VOC's:
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Manufacturers' Field Reports: manufacturers' field reports specified.

## **1.4 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.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 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 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: to CSA B79.
- .2 Type 1: general duty; cast iron body round, square as indicated, adjustable head, sediment basket nickel bronze strainer, integral seepage pan, and clamping collar.

### **2.2 FUNNEL FLOOR DRAINS**

- .1 Funnel Floor Drains: to CSA B79.
- .2 Type 3: funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.

### **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 square cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor Access: rectangular 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: nickel bronze square, gasket, vandal-proof screws.
- .3 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

**2.4 NON-FREEZE WALL HYDRANTS**

- .1 Surface mount with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Polished bronze finish.

**2.5 WATER HAMMER ARRESTORS**

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

**2.6 BACK FLOW PREVENTERS**

- .1 Preventers: to CSA-B64 Series, application as indicated.

**2.7 VACUUM BREAKERS**

- .1 Breakers: to CSA-B64 Series-11 (R2016), vacuum breaker atmospheric.

**2.8 BACKWATER VALVES**

- .1 Coated extra heavy cast iron body with bronze seat, revolving bronze flapper and threaded cover.
- .2 Access:
  - .1 Surface access.
  - .2 Concrete access pit with cover, as indicated.

**2.9 WATER METERS**

- .1 Displacement type to ANSI/AWWA C700.
- .2 Capacity: as indicated.

**2.10 TRAP SEAL PRIMERS**

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

**2.11 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.

**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.
- .2 Inform Departmental Representative 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 Departmental Representative.

### **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 and as indicated.

### **3.6 WATER HAMMER ARRESTORS**

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

### **3.7 BACK FLOW PREVENTERS**

- .1 Install in accordance with CSA-B64 Series-11 (R2016), where indicated and elsewhere as required by code.
- .2 Pipe discharge to terminate over nearest drain or service sink.

### **3.8 BACKWATER VALVES**

- .1 Install where indicated.
- .2 Install in access pit.

### **3.9 HOSE BIBBS AND SEDIMENT FAUCETS**

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

### **3.10 TRAP SEAL PRIMERS**

- .1 Install for floor 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.

- .3 Install plastic tubing to floor drain.

### **3.11 STRAINERS**

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

### **3.12 WATER METERS**

- .1 Install water meter provided by local water authority.
- .2 Install water meter as indicated.

### **3.13 START-UP**

- .1 General:
- .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.
- .3 Provide continuous supervision during start-up.

### **3.14 TESTING AND ADJUSTING**

- .1 Timing:
  - .1 After start-up deficiencies rectified.
  - .2 After certificate of completion has been issued by authority having jurisdiction.
- .2 Application tolerances:
  - .1 Pressure at fixtures: +/- 70 kPa.
  - .2 Flow rate at fixtures: +/- 20%.
- .3 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.
- .4 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.
- .5 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.
- .6 Access doors:

- .1 Verify size and location relative to items to be accessed.
- .7 Cleanouts:
  - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Water hammer arrestors:
  - .1 Verify proper installation of correct type of water hammer arrester.
- .9 Wall hydrants:
  - .1 Verify complete drainage, freeze protection.
  - .2 Verify operation of vacuum breakers.
- .10 Strainers:
  - .1 Clean out repeatedly until clear.
  - .2 Verify accessibility of cleanout plug and basket.
  - .3 Verify that cleanout plug does not leak.
- .11 Hose bibbs, sediment faucets:
  - .1 Verify that flow and pressure meet design criteria.
  - .2 Check for leaks, replace compression washer if required.
- .12 Water meters:
  - .1 Verify location and accessibility.
  - .2 Test meter reading accuracy.

### **3.15 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.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.16 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 OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
  - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
  - .3 CAN/CSA-B651-12(R2017), Accessible Design for the Built Environment.
- .2 Green Seal Environmental Standards (GSES)
  - .1 CSA-B651, Commercial Adhesives.
- .3 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

**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 washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 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.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual 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.
  - .3 List of recommended spare parts.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 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 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 MANUFACTURED UNITS**

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: as indicated.
- .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:
  - .1 WC-1: vitreous china with antimicrobial surface which inhibits the growth of stain and odor causing bacteria mold and mildew, elongated bowl, white finish, floor mounted, siphon jet flush action, operates in the range of 4.2 L to 6 L per flush, condensate channel, 305 mm x 254 mm water surface, 54 mm fully glazed internal trapway, floor outlet, bolt caps, 38 mm dia. top spud.
    - .1 Exposed Flush Valve; top spud, Polished Chrome finish, 4.8 L per flush, self-cleaning brass piston with integral wiper spring prevents clogging, chrome plated metal wall plate with infrared sensor, solenoid flush controller circuitry 24 Hour sentinel flush, mechanical courtesy manual over-ride flush, V.P. Stop cap on back-check angle stop, exposed CP elbow for top spud connection, flush tube for 292 mm rough-in, high back pressure vacuum breaker, PWRX 10-year battery system.
    - .2 Seat; extra heavy duty, for elongated bowl, open front, white finish solid polypropylene plastic, less cover, stainless steel check hinges, post nuts and washers.
  - .2 WC-2: barrier-free, vitreous china with antimicrobial surface which inhibits the growth of stain and odor causing bacteria mold and mildew, elongated bowl, white finish, wall hung, siphon jet flush action, operates in the range of 4.2 L to 6 L per flush, condensate channel, 305 mm x 254 mm water surface, 54 mm fully glazed internal trapway, 38 mm dia. top spud.
    - .1 Exposed Flush Valve; top spud, Polished Chrome finish, 4.8 L per flush, self-cleaning brass piston with integral wiper spring prevents clogging, chrome plated metal wall plate with infrared sensor, solenoid flush controller circuitry 24 Hour sentinel flush, mechanical courtesy manual over-ride flush, V.P. Stop cap on back-check angle stop, exposed CP elbow for top spud connection, flush tube for 292 mm rough-in, high back pressure vacuum breaker, PWRX 10-year battery system.

- .2 Seat; extra heavy duty, for elongated bowl, open front, white finish solid polypropylene plastic, less cover, stainless steel check hinges, post nuts and washers.
  - .3 Mount fixture 406mm above finished floor to rim of toilet or as required to meet local codes.
  - .4 Back Rest, satin finish type 304 1.2 mm stainless steel bar, 152 mm back to front, 32 mm tubing diameter, antique white solid core plastic laminate panel.
  - .5 Carrier; single vertical adjustable, mounted on concrete floor, all epoxy coated cast iron fitting, adjustable ABS slide nipple with integral test cap and neoprene bowl gasket, wasted plated hardware, chrome cap nuts, 76 mm no hub waste, 51 mm no hub vent, 226.8 kg (500 lbs) static load.
- .8 Urinals:
- .1 U-1: vitreous china, operates in the range of 0.5 L to 3.8 L per flush, wall hung, washdown action, flushing rim, 19 mm dia. top spud, outlet spud with 40 mm tubing tailpiece, 2 wall hangers, integral strainer, white finish.
    - .1 Exposed Flush Valve; top spud urinal, polished chrome finish, 1.9 L factory set flow, self-cleaning brass piston with integral wiper spring prevents clogging, chrome plated metal wall plate with infrared sensor, solenoid flush controller circuitry 24 Hour sentinel flush automatic stadium function, mechanical courtesy manual over-ride flush, V.P. Stop cap on back-check angle stop, flush tube for 292 mm rough-in, vacuum breaker, under a heavy duty metal stylish cover with plastic optical face, DC Powered (CR-P2 Lithium Battery).
    - .2 Carrier; mounted on concrete floor, epoxy coated top and bottom universal steel hanger plates, heavy gauge epoxy coated steel offset uprights with welded feet supports. For one unit: 102 mm of pipe space.
- .9 Washroom Lavatories:
- .1 L-1 : Wall-hung, integral back:
    - .1 3 holes, 102 mm center, 521 mm x 464 mm x 308 mm high, vitreous china, white finish, for carrier with concealed arms, front overflow, self-draining faucet ledge, contoured back and side splash shield.
    - .2 Faucet; chrome plated finish, brass, 8.3 LPM aerator outlet, brass swing gooseneck spout, 137 mm projection reach, 4" long red and blue indexed wrist blade handles.
    - .3 Below Deck Mechanical Water Mixing Valve; bronze body, temperature adjusting dial, 10 mm inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 48.8 °C, integral checks, offer temperature range from full cold through 46 °C. Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.
    - .4 Open Grid Drain; cast brass body, 32 mm tailpiece.
    - .5 Faucet Supplies; chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm I.D. Inlet x 127 mm horizontal

- extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers.
- .6 P-Trap; heavy cast brass adjustable body, with slip nut, 32 mm size, shallow wall flange and seamless tubular wall bend.
  - .7 Fixture Carrier; universal steel hangar support plates with integral mounting brackets, heavy gauge epoxy coated steel uprights with welded feet. For one unit: 102 mm of pipe space.
- .2 L-2: wall-hung, for handicapped.
- .1 3 holes, 102 mm center, 540 mm x 520 mm x 165 mm high, vitreous china, white finish, for carrier with concealed arms, rear overflow, recessed self-draining faucet ledge, semi-pedestal P-trap cover.
  - .2 Faucet; chrome plated finish, brass, 8.3 LPM aerator outlet, brass swing gooseneck spout, 137 mm projection reach, 102 mm long red and blue indexed wrist blade handles.
  - .3 Below Deck Mechanical Water Mixing Valve; bronze body, temperature adjusting dial, 10 mm inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 48.8 °C, integral checks, offer temperature range from full cold through 46 °C. Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.
  - .4 Open Grid Drain; cast brass body, 32 mm tailpiece.
  - .5 Faucet Supplies; chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm I.D. Inlet x 127 mm horizontal extension tubes, combination V.P. Loose key handles, escutcheon and stainless steel braided flexible risers.
  - .6 P-Trap; heavy cast brass adjustable body, with slip nut, 32 mm size, shallow wall flange and seamless tubular wall bend.
  - .7 Basin Carrier; concealed arms, wall flanges to attach to backing plate secured in wall with locking device and levelling screws, heavy gauge steel uprights with integral welded feet. For one unit: 102 mm of pipe space.

### **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 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 NBCC and CAN/CSA B651.

### **3.3 ADJUSTING**

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

### **3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
  - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
  - .3 CAN/CSA-B651-12(R2017), Accessible Design for the Built Environment.

**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 fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Indicate fixtures and trim:
  - .1 Dimensions, construction details, roughing-in dimensions.
  - .2 Factory-set water consumption per flush at recommended pressure.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual 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.
  - .3 List of recommended spare parts.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 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 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 MANUFACTURED UNITS**

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures to be product of one manufacturer.
- .6 Trim to be product of one manufacturer.
- .7 Mop sinks:
  - .1 MSB-1: Sink: 610 mm wide x 610 mm long x 254 mm high deep, floor mounted, molded stone, white, plain curbs, stainless steel drain with strainer, 76 mm outlet.
  - .2 Faucet; Polished Chrome finish, flexible installation within the range of 152 mm to 254 mm, cast brass body, washerless ceramic disc valve cartridges, 22.7 LPM unrestricted hose end outlet, spout with atmospheric vacuum breaker and bucket hook, 237 mm from wall to outlet reach, lever handles, top brace.
  - .3 Accessories;
    - .1 Bumper Guard 610 mm stainless steel.
    - .2 Hose and Wall Hook 762 mm long flexible heavy duty 15mm rubber hose, cloth reinforced with 20mm chrome coupling. Bracket is 127 mm long by 76.2 mm stainless steel rubber grip.
    - .3 Two (2) 305 mm x 305 mm Back Splash Panels.
    - .4 Quick Drain Connector 76 mm with 51 mm hole. EFS basins.
- .8 Stainless steel counter-top sinks.
  - .1 SS-1: double bowl, countertop mount:
    - .1 Sink; 3 holes, 203 mm center, 794 mm wide x 521 mm long x 203 mm high deep, spillway, counter mounted, backledge, grade 18-8 20 GA. (0.9 mm) type 302 stainless steel, mirror finish rim, satin finish bowls, radius coved bowls corners, mounting kit provided, fully undercoated to reduce condensation and resonance, 89 mm crumb cup waste assembly with 38 mm tailpiece.
    - .2 Faucet; Polished Chrome finish, brass, 5.7 LPM pressure compensating aerator, rigid/swing gooseneck spout, 203 mm projection reach, 102 mm long vandal resistant red and blue indexed wrist blade handles.
    - .3 Below Deck Mechanical Water Mixing Valve; bronze body, temperature adjusting dial, 10 mm inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 48.8 °C, integral checks, offer temperature range from full cold through 46 °C. Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.
    - .4 Faucet Supplies; chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm I.D. Inlet x 127 mm horizontal

- extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers.
- .5 P-Trap; heavy cast brass adjustable body, with slip nut, 38 mm size, box flange and seamless tubular wall bend.
- .9 Laundry tubs:
- .1 LT-1: Single compartment.
    - .1 3 holes, 102 mm center, 584 mm wide x 584 mm long x 340 mm high deep, floor mounted, molded stone, White, white baked enamel steel legs, strainer and integral drain and plug, 38 mm tailpiece.
    - .2 Faucet; Polished Chrome finish, metal deck plate, full flow, spout with hose end, 156 mm projection reach, metal lever handles.
    - .3 Below Deck Mechanical Water Mixing Valve; bronze body, temperature adjusting dial, 10 mm inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 48.8 °C, integral checks, offer temperature range from full cold through 46 °C. Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.
    - .4 Faucet Supplies; chrome plated finish polished brass, heavy duty angle stops, 10 mm I.P.S. Inlet x 76 mm long rigid horizontal nipples, V.P. Loose keys, escutcheon and flexible copper risers.
    - .5 P-Trap; heavy cast brass adjustable body, with slip nut, 38 mm size, box flange and seamless tubular wall bend.

### **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 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA-B651.

#### **3.3 ADJUSTING**

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
  - .1 Adjust water flow rate to design flow rates.
  - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:

- .1 Aerators: operation, cleanliness.
- .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
  - .1 Verify temperature settings, operation of control, limit and safety controls.

### **3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
  - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
  - .3 CAN/CSA-B651-12(R2017), Accessible Design for the Built Environment.

**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 fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Indicate fixtures and trim:
  - .1 Dimensions, construction details, roughing-in dimensions.
  - .2 Factory-set water consumption per flush at recommended pressure.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual 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.
  - .3 List of recommended spare parts.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 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 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 MANUFACTURED UNITS**

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Individual shower.
  - .1 SH-1: Barrier Free shower.
    - .1 Pressure Balancing Shower Valve Trim; Polished Chrome finish, brass wall plate, 210 mm high trim face plate, on/off and temperature control single lever handle.
    - .2 Pressure Balance in-wall Shower Rough Valve; cast brass body, 13 mm Female Thread IPS inlet(s)/outlet(s), ceramic disc valve cartridges, integral hot water limit stop, screw driver stops, back-to-back capability.
    - .3 Complete Hand Shower kit; 94 mm face dia, 9.5 LPM 5-Function Hand shower, easy clean spray nozzles, check valve and pressure compensating flow control device, complete with 1524 mm long hose and wall supply. Hand shower Slide Bar, 610 mm high cylindrical bar, adjustable bracket for personal shower, anchors/screws and mounting brackets included.
    - .4 Hand Shower In-Line Vacuum Breaker; installed between supply outlet and shower hose.
    - .5 Floor Drain; epoxy coated cast iron, 127 mm adjustable round nickel bronze strainer, reversible clamping collar with primary & secondary weepholes. Provide extra floor drain at entrance of shower area. Provide P-Trap, same material as the connecting pipe drain.

**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 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

### **3.3 ADJUSTING**

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
  - .1 Adjust water flow rate to design flow rates.
  - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 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 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**