

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section 22 11 18.

1.2 SECTION INCLUDES

- .1 Materials and installation for copper domestic water service used in the following:
 - .1 Copper incoming domestic water service, up to NPS 3.
 - .2 Hard drawn copper domestic hot and cold water.
 - .3 Soft copper tubing inside building.
 - .4 Soft copper buried tubing outside building, as in between potable water source and meter inside building.
- .2 Sustainable requirements for construction, verification and operation:
 - .1 See General Specs.

1.3 RELATED SECTIONS

- .1 Division 01 – General Requirements.
- .2 Section 23 05 05 - Installation of Pipework.
- .3 Section 23 05 23.01 - Valves - Bronze.
- .4 Section 23 05 23.02 - Valves - Iron
- .5 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.4 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME):
 - .1 ANSI/ASME B16.15-02, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 American Society for Testing and Materials International, (ASTM):
 - .1 ASTM A307-03, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B88M-03, Standard Specification for Seamless Copper Water Tube (Metric).
 - .3 ASTM F492-95, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.

- .4 ASTM A536-84 (1999) e1, Standard Specification for Ductile Iron Castings.
- .3 American Water Works Association (AWWA):
 - .1 AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - .2 AWWA C606-97, Grooved and Shouldered Joints.
- .4 Canadian Standards Association (CSA International):
 - .1 CSA B242-M1980 (R1998), Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Department of Justice Canada (Jus):
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):
 - .1 MSS-SP-67-02, Butterfly Valves.
 - .2 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-97, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction:
 - .1 NRCC 38728, National Plumbing Code of Canada (NPC) - 2005.

1.5 SUBMITTALS

- .1 Submittals in accordance with Division 01 – General Requirements.
- .2 Submit product data for all valves, pipe and equipment.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.
- .4 Coordinate submittal requirements and provide submittals required by Division 01 – General Requirements.
- .5 Provide maintenance data for incorporation into manual specified in Division 01 – General Requirements.

1.6 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Division 01 – General Requirements.

1.7 STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Division 01 – General Requirements.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Separate for reuse and recycling and place in designated containers.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

General Note: All components used for the domestic water system shall be lead-free.

2.1 PIPING

- .1 Domestic hot, cold, recirculation and trap primer 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 Bronze pipe flanges and flanged fittings, Class 150 and 300: in accordance with ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: in accordance with ANSI/ASME B16.15.
- .3 Cast copper, solder type: in accordance with ANSI/ASME B16.18
- .4 Wrought copper and copper alloy, solder type: in accordance with ANSI/ASME B16.22.

2.3 JOINTS

- .1 Rubber gaskets, 1.6 mm thick: in accordance with AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: containing less than 0.2% lead.
- .4 Teflon tape: for threaded joints.
- .5 Dielectric connections between dissimilar metals: dielectric fitting in accordance with ASTM F492, complete with thermoplastic liner.

2.4 GATE VALVES

- .1 NPS 2 and under, soldered:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, screwed:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2-1/2 and over, flanged:
 - .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23.02 - Valves - Iron.

2.5 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, re-grindable seat as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, re-grindable seat as specified Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2-1/2 and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap specified Section 23 05 23.02 - Valves - Iron.

2.6 BALL VALVES

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

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with National Plumbing Code and Applicable Laws.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.

- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
- .5 Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be moulded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for Contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
- .6 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.
- .7 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .8 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.2 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using lock shield globe valves. Mark settings and record on as-built drawings on completion.
- .3 Install extension stems for insulated piping.

3.3 PRESSURE TESTS

- .1 Test pressure: greater of 1 time's maximum system operating pressure or 860 kPa. for 24 hours, no appreciable loss.

3.4 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Provincial potable water guidelines. Let system flush for additional 2 h, 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 Applicable Laws and approval of Engineer.
- .2 Upon completion, provide laboratory test reports on water quality to Engineer.

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 (if any) 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 Timing:
 - .1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 TAB DHWR (if applicable) 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 DHW and DHWR 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 off 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, verifying that no residuals remain as a result of flushing and/or cleaning.
- .3 Reports:
 - .1 In accordance with Division 01 – General Requirements.
 - .2 Include certificate of water flow and pressure tests conducted.
- .4 Verification requirements in accordance with Division 01 – General Requirements, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Local/regional materials.
 - .6 Low-emitting materials.

3.9 OPERATION REQUIREMENTS

- .1 Operational requirements in accordance with Division 01 – General Requirements shall include:
 - .1 Cleaning materials and schedules.
 - .2 Repair and maintenance materials and instructions.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section 22 13 17.

1.2 SUMMARY

- .1 Section includes:
 - .1 The installation of sanitary waste and vent piping.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM):
 - .1 ASTM B32-03, Specification for Solder Metal.
 - .2 ASTM B306-02, Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-03a, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International):
 - .1 CSA B67-1972 (R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70-02, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125-01, Plumbing Fittings.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Construction occupational health and safety in accordance with Division 01 – General Requirements.

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 Waste Management and Disposal:
 - .1 Separate and recycle waste materials in accordance with Division 01 – General Requirements.
 - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 MATERIAL

- .1 Sustainable Requirements:
 - .1 Materials and resources in accordance with Division 01 – General Requirements.

2.2 COPPER TUBE AND FITTINGS

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

2.3 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent minimum NPS 3, to: CAN/CSA-B70:
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.
 - .2 Above ground sanitary and vent: to CAN/CSA-B70:
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.
 - .3 Manufactured in Canada or United States.

2.4 PLASTIC PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent, DWV PVC piping, socket weld installation: CAN/CSA-B181.2, schedule 40 minimum.
 - .1 Joints:
 - .1 Solvent weld for PVC: to ASTM D2564.

Part 3 Execution

3.1 INSTALLATION

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code and Applicable Laws.
- .3 Install with expansion/compensating offsets.

3.2 TESTING

- .1 Hydraulically test to verify grades and freedom from obstructions. Monitor levels for min. 24 hour.
- .2 Pressure test buried systems before backfilling.

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Affix applicable label (sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.4 VERIFICATION

- .1 Verification requirements in accordance with Division 01 – General Requirements, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Local/regional materials.
 - .6 Low-emitting materials.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section 22 42 01.

1.2 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing specialties and accessories.
 - .2 Sustainable requirements for construction and verification.
- .2 Related Sections:
 - .1 Division 01 – General Requirements.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
 - .1 ASTM A126-95 (2001), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA):
 - .1 AWWA C700-02, Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 AWWA C701-02, Cold Water Meters-Turbine Type for Customer Service.
 - .3 AWWA C702-1-01, Cold Water Meters-Compound Type.
- .3 Canadian Standards Association (CSA International):
 - .1 CSA-B64 Series-01, Backflow Preventers and Vacuum Breakers.
 - .2 CSA-B79-94 (R2000), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
 - .3 CSA-B356-00, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Material Safety Data Sheets (MSDS).
- .5 Plumbing and Drainage Institute (PDI):
 - .1 PDI-G101-96, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
 - .2 PDI-WH201-92, Water Hammer Arresters Standard.

1.4 SUBMITTALS

- .1 Submittals in accordance with Division 01 – General Requirements.
- .2 Co-ordinate submittal requirements and provide submittals required by Division 01 – General Requirements.

- .3 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 Division 01 – General Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories for following: soap dispensing system.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions: submit manufacturer's installation instructions.
- .7 Manufacturers' Field Reports: manufacturers' field reports specified.
- .8 Closeout submittals: submit maintenance and engineering data for incorporation into manual as specified in Division 01 – General Requirements, include:
 - .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 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance Division 01 – General Requirements.
- .2 Construction requirements: in accordance with Division 01 – General Requirements.
- .3 Verification: contractor's verification in accordance with Division 01 – General Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Division 01 – General Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.
 - .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.
- .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

General Note: All components used for the domestic water systems shall be lead-free.

2.1 MATERIALS

- .1 Materials and resources in accordance with Division 01 – General Requirements.

2.2 FLOOR DRAINS

- .1 Floor drains and trench drains: to CSA B79 materials and resources in accordance with Division 01 – General Requirements.
- .2 Materials and resources in accordance with Division 01 – General Requirements.
- .3 Refer to plumbing schedule on drawings for performance, size and other information

2.3 CLEANOUTS

- .1 Line Cleanouts: heavy cast iron pipe with taper thread cover secured to body with full size pipe opening.
- .2 Stack Cleanout: In base of cast iron stacks with neoprene gasketted secured cover. Where cleanouts are concealed behind finished walls access to be made by round stainless steel plate and slotted flat head screws.
- .3 Floor Cleanouts:
 - .1 In unfinished areas and outside areas, Duco coated cast iron body with integral clamp device and removable positive seal closure plug and heavy duty 150mm diameter adjustable cover secured with stainless steel screws. And C.O. cast in cover for waterproof areas provide 'flange with flashing clamp.
 - .2 In tiled areas same as above with square nickel bronze cover and frame recessed for tile. Cover to be adjustable to suit floor lines when installing in finished floor.
 - .3 Finished areas: same as above with nickel bronze frame and cover for medium traffic load.
 - .4 For heavy traffic areas: same as above with extra heavy nickel bronze cover and frame.

2.4 WATER HAMMER ARRESTORS

- .1 Brass piston in a type K copper casing sized in accordance with manufacturer's recommendations to eliminate water hammer and shock from piping systems. Provide on hot and cold water lines to all quick valves, solenoids and locate horizontally at the end of line closest to supply source.

2.5 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application as indicated reduced pressure principle type or double check valve assembly back flow preventer with intermediate atmospheric vent or vacuum breaker.
- .2 Acceptable Manufacturer:
 - .1 Appliance Backflow Preventer:
 - .1 RP Type: Reduced Pressure Principle.
 - .2 PVB Type: Pressure Vacuum Breaker.

2.6 VACUUM BREAKERS

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

2.7 PRESSURE VACUUM BREAKERS

- .1 Lead Free, Anti-siphon, spill resistant pressure vacuum breaker.
- .2 Certified to NSF/ANSI 61.
- .3 Full port ball valves.
- .4 Low lead bronze (ASTM B 584) with integrated modular check and float assembly made from thermoplastics.
- .5 Stainless steel spring.
- .6 The valve shall incorporate a diaphragm to separate the air inlet from the potable water supply preventing spillage.

2.8 PRESSURE REGULATORS

- .1 Capacity: as indicated:
 - .1 Inlet pressure: to 100 psi.
 - .2 Outlet pressure: 45 psi.
- .2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.
- .3 NPS2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.
- .4 Semi-steel spring chambers with bronze trim.

2.9 STRAINERS

- .1 860 kPa, Y type with 20 mesh, Monel, bronze or stainless steel removable screen.
- .2 NPS2 and under, bronze body, screwed ends, with brass cap.

2.10 CIRCUIT BALANCING VALVE (NPS ½" – 2" VALVE)

- .1 Valves are to be of the '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 Valve shall be design for potable water.
- .3 Valve shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve Hand wheel. Valves shall have a minimum of five full 360° hand wheel turns.
- .4 Valve handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.
- .5 Valves shall be furnished with precision machined Venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The Venturi shall have two, 25 mm (1/4") threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve.
- .6 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.
- .7 The hand wheel shall be high-strength resin.

2.11 TRAP SEAL PRIMERS

- .1 Refer to plumbing schedule on drawings for performance, size and other information.
- .2 Install where indicated on drawings.

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, Provincial Codes and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

- .3 Where components are accessible, install with vandal proof screws.

3.3 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, at locations required, by 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 NPS4.

3.4 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures, all flush valves, mop sinks, downstream of all fixtures fed with solenoid, all equipment (re-processors and washers) and elsewhere where indicated.

3.5 BACK FLOW PREVENTERS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .2 Pipe discharge to terminate over nearest drain or service sink (above p-trap) as indicated on drawing.
- .3 All backflow preventers to be accessible. Do not install in ceiling space. Install with center line height between 750 mm and 1500 mm above floor.

3.6 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water.
- .3 Install soft copper tubing to floor drain.
- .4 Trap primer shall be controlled by the BMS. Plumbing contractor shall coordinate with the controls contractor.

3.7 STRAINERS

- .1 Install with sufficient room to remove basket.

3.8 CIRCUIT BALANCING VALVE (NPS ½" – 2" VALVE)

- .1 Install circuit balancing valve as per manufacturer's recommendation where indicated on the plans and where required for flow balancing (including trap seal primers).

3.9 START-UP

- .1 General:
 - .1 In accordance with Division 01 – General Requirements.
- .2 Timing: start-up only after:
 - .1 Pressure tests have been completed.

- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

3.10 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Division 01 – General Requirements, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Wood.
 - .8 Low-emitting materials.

3.11 TESTING AND ADJUSTING

- .1 General:
 - .1 In accordance with Division 01 – General Requirements.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- 70 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .6 Vacuum breakers:
 - .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.
- .3 Verify visibility of discharge from open ports.
- .7 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .8 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .9 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .10 Pressure regulators, PRV assemblies:
 - .1 Adjust settings to suit locations, flow rates, pressure conditions.
- .11 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .12 Commissioning Reports:
 - .1 In accordance with Division 01 – General Requirements.
- .13 Training:
 - .1 In accordance with Section 21 05 01 – Common Work Results For Mechanical.

END OF SECTION