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PART 1 - GENERAL1.1 RELATED  
REQUIREMENTS

- .1 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18-2013, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .4 ANSI/ASME B16.24-2011, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
  - .1 ASTM A 307-2014, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .2 ASTM B 88M-2013, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
  - .1 ANSI/AWWA C111/A21.11-2012, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA B242-05 (R2016), Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-80-2013, 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) - 2015.

1.3 ACTION AND  
INFORMATIONAL  
SUBMITTALS

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

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- .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.
- 1.4 SUSTAINABLE REQUIREMENTS
- .1 Construction:
    - .1 Sustainable construction requirements include:
      - .1 Specific construction requirements for project.
      - .2 Specification text to ensure that project will comply with PWGSC green design process and sustainability requirements.
      - .3 Administrative, temporary and procedural requirements for the use of materials and methods of construction.

## PART 2 - PRODUCTS

- 2.1 PIPING
- .1 Domestic hot, cold and recirculation systems, within building.
    - .1 Above ground: copper tube, hard drawn, type L or M: to ASTM B 88M.
    - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B 88M, in long lengths and with no buried joints.
- 2.2 FITTINGS
- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
  - .2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
  - .3 Cast copper, solder type: to ANSI/ASME B16.18.
  - .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

- .5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
- .6 NPS 1 ½ and smaller: wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

### 2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.
- .3 Solder: 95/5.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

### 2.4 BALL VALVES

- .1 NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and Bunan seat, steel lever handle.
- .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.

## 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 and local authority having jurisdiction.
- .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 Install on Pipe Supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with gate or ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1 times 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 copper to Provincial or Federal 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 approval of Departmental Representative.
- .2 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.
  - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Bring HWS storage tank up to design temperature slowly.
  - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
  - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

### 3.9 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.

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- .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.

### 3.10 OPERATION REQUIREMENTS

- .1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products.
- .2 Operational requirements include:
  - .1 Cleaning materials and schedules.
  - .2 Repair and maintenance materials and instructions.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment
- 1.2 REFERENCES
- .1 ASTM International Inc.  
.1 ASTM B 32-2014, Standard Specification for Solder Metal.  
.2 ASTM B 306-2013, Standard Specification for Copper Drainage Tube (DWV).
- .2 Canadian Standards Association (CSA International).  
.1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.  
.2 CAN/CSA-B70-2013, Cast Iron Soil Pipe, Fittings and Means of Joining.  
.3 CAN/CSA-B125.3-2012, Plumbing Fittings.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:  
.1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

- 2.1 SUSTAINABLE MATERIAL
- .1 Sustainable Requirements: materials and products.
- .2 Adhesives and Sealants:in Joint Sealants.
- 2.2 COPPER TUBE AND FITTINGS
- .1 Above ground sanitary, storm and vent Type DWV to: ASTM B 306.  
.1 Fittings.  
.1 Cast brass: to CAN/CSA-B125.3.  
.2 Wrought copper: to CAN/CSA-B125.3.  
.2 Solder: 50:50, lead free, 95:5, to ASTM B 32.

2.3 CAST IRON  
PIPING AND FITTINGS

- .1 Above ground sanitary, storm and vent: to CAN/CSA-B70.
  - .1 Joints:
    - .1 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 - EXECUTION3.1 APPLICATION

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

3.2 INSTALLATION

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

3.3 TESTING

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

3.4 PERFORMANCE  
VERIFICATION

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

- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 22 11 16 - Domestic Water Piping.
  - .2 Section 21 05 01 - Common Work Results for Mechanical clause 3.2 Demonstration.
- 1.2 REFERENCES
- .1 Plumbing and Drainage Institute (PDI)
    - .1 PDI-WH201-R2010, Water Hammer Arresters Standard.
    - .2 National Plumbing Code of Canada - 2015
- 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.
  - .3 Shop Drawings:
    - .2 Drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details.
  - .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.

PART 2 - PRODUCTS

2.1 WATER HAMMER  
ARRESTORS

- .1 Copper construction, bellows piston type: to PDI-WH201.

2.2 HOT WATER  
TANK

- .1 To CSA C22.2 No. 60950-1, CSA C191-13 and ASHRAE 90.1-2013. Glass lined tank with warranty extending more than 24 months. Insulate with 50mm minimum fiberglass insulation with outer casing of sheet steel with baked enamel finish.
- .2 Provide adjustable thermostat control with 16 to 60 deg. C range. Glass lined construction, fitted with distributor tube, combination temperature and pressure relief valve, built to withstand a gauge test pressure of 2 MPa, a gauge working pressure of 1000 kPa, valved drain. Unit shall be equipped with copper-resistor type flanged immersion elements, surface mounted thermostat, switching contactors, 120 volt control circuit with transformer and manual reset high temperature limit control. Heating: electric, flip-flop. Capacity: As Shown on the drawings.

2.3 Floor Drains

- .1 Epoxy coated cast iron with integral pan with clamping collar, and adjustable head with grate, and oval funnel where shown, 200 mm nominal heavy duty grate.

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.
- 3.3 WATER HAMMER ARRESTORS
- .1 Install on branch supplies to fixtures or group of fixtures.
- 3.4 START-UP
- .1 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.
  - .2 Provide continuous supervision during start-up.
- 3.5 TESTING AND ADJUSTING
- .1 Water hammer arrestors:
    - .1 Verify proper installation of correct type of water hammer arrester.
- 3.6 HOT WATER TANK
- .1 Install in accordance with manufacturer's recommendations.
  - .2 Provide structural steel for heater tank mounting.
  - .3 Provide insulation between tank and supports.
  - .4 Pipe relief valve to nearest floor drain.
  - .5 Provide stainless steel drain pan around entire area under the domestic hot water heater if the heater is larger than 622mm in diameter, otherwise the drain pan shall be part of the package with the WAGS valve. Mount water and gas safety valve within the pan either adjacent or under the domestic hot water heater all in accordance with the manufacturers installation instructions. If at all possible, the floor drain should be located within the drain pan area where the pan and heater are located on the floor.
- 3.7 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

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PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 22 11 16 - Domestic Water Piping.
  - .2 Section 22 13 17 - Drainage Waste and Vent Piping-Cast Iron and Copper.
  - .3 Section 21 05 01 - Common Work Results for Mechanical clause 3.2 Demonstration.
- 1.2 REFERENCES
- .1 Canadian Standards Association (CSA International)
    - .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
    - .2 CAN/CSA-B125.3-2012, Plumbing Fittings.
    - .3 CAN/CSA-B651-2015, Accessible Design for the Built Environment.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Product Data:
    - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.4 CLOSEOUT SUBMITTALS
- .1 Provide maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

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.

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- .5 Fixtures to be product of one manufacturer.
  - .6 Trim to be product of one manufacturer.
  - .7 Stainless steel counter-top sinks.
    - .1 SK-1: single compartment, ledge-back.
      - .1 From 1.0mm thick type 302 stainless steel, self-rimming, undercoated, clamps. Overall sizes: 520 x 410 x 130mm.
      - .2 Trim: chrome plated brass, with swing spout, aerator, single lever handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, spray fitting.
  - .8 Wall-mounted lavatories.
    - .1 LAV-1: single basin, sensor faucet.
      - .1 Vitreous china wall hung, integral contoured back splash lip, supply openings on 100 mm centres, rear overflow, concealed arms, NPS 1-1/4 chrome plated adjustable P-trap, offset style with open grid type strainer, chrome finish polished brass, faucet supplies with commercial duty ¼ turn ball valves angle stop, horizontal extension tubes, combination v.p. loose key handle, escutcheon and flexible copper riser. Supply steel and cast iron wall carrier suitable to fixture and handicapped requirements. For drywall partition installations, carrier shall be supplied with support legs extending down to the floor. Install in accordance to barrier free requirements where fixture is located in a barrier free washroom.
      - .2 Trim: Faucet shall be sensor activated, hard wired, chrome plated cast brass, 1.9 lpm (0.5 gpm), sensor range adjustment screw, variable time out setting, vandal resistant spray head with pressure compensating flow control, thermostatic mixing valve below counter. Provide 120V/24 V transformer as required. Set faucet discharge temperature to 43 deg C.
  - .9 Wall-mounted urinals.
    - .1 UR-1: single compartment, ledge-back.
      - .1 Vitreous china washdown flush action for 0.5 litre to 1.9 litre per flush, integral flush spreader, open trap, removable stainless steel strainer, 3/4" (19 mm) top spud, and outlet, 2" (50 mm) connecting flange with gasket and bolts.

- Chrome plated quiet action diaphragm or piston type flush valve with vacuum breaker, angle stop, pressure loss check and non-hold open feature. Wall access cleanout with round stainless steel face and v.p. stainless steel screw. Carrier with steel pipe legs, block base feet supports and bearing plates. Provide fixture carrier and sanitary connection accessories suitable to fixture.
- .2 Trim: Sensor activated, hard wired, exposed chrome plated quiet action diaphragm or piston type flush valve, 1.9 lpf, with wall mounted, recessed sensor with stainless steel wall plate. Wall plate shall be supplied with manual override button. Provide 120V/24 V transformers as required.
- .10 Wall Mounted Water closets.
- .1 WC-1: Standard height, manual flush valve.
- .1 Vitreous china elongated syphon jet action bowl, height 15" (381 mm) to rim, 1½" (38 mm) top spud, with flange bolts, bolt caps. Suitable to handle 4.2 to 6 litre per flush. Elongated heavy duty solid plastic seat open front less cover with check hinges and chromated steel posts, washers and nuts. Provide one flush valve per floor drain with trap primer connection on back of drop pipe. Provide fixture carrier and sanitary connection accessories suitable to fixture.
- .2 Trim: Chrome plated, standard manual flush valve, piston or diaphragm type.
- .2 WC-2: Barrier free, manual flush valve.
- .1 Vitreous china elongated syphon jet action wall mounted bowl 16" (410 mm) high, concealed trapway 1½" (38 mm) top spud, with flange bolts, bolt caps. Suitable to handle 4.2 to 6 litre per flush. Elongated heavy duty solid plastic open front seat less cover, check hinges and chromated steel posts, washers and nuts. Provide fixture carrier and sanitary connection accessories suitable to fixture. Coordinate installation height of flush valve with grab bars and other washroom accessories. Provide permanent back rest.
- .2 Trim: Chrome plated, standard manual flush valve, piston or diaphragm type.
- .11 Fixture piping:
- .1 Hot and cold water supplies to each fixture:
- .1 Chrome plated rigid supply pipes each with screwdriver stop, reducers, escutcheon.

- .2 Waste:
  - .1 Brass P trap with clean out on each fixture not having integral trap.
  - .2 Chrome plated in all exposed places.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

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

#### 3.2 INSTALLATION

- .1 Mounting heights:
  - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
  - .2 Wall-hung fixtures: as per the NBCC, measured from finished floor.
  - .3 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.
- .4 Thermostatic controls:
  - .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION