PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

1. Section 22 13 18 – Drainage waste and vent.
2. Section 22 11 16 – Domestic water piping copper.
3. Section 23 05 29 – Hangers and supports for specification.
4. Section 23 07 15 – Thermal insulation for specification.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. Shop drawings to show:
    1. Mounting arrangements.
    2. Operating and maintenance clearances.
3. Shop drawings and product data accompanied by:
    1. Detailed drawings of bases, supports, and anchor bolts.
    2. Acoustical sound power data, where applicable.
    3. Points of operation on performance curves.
    4. Manufacturer to certify current model production.
    5. Certification of compliance to applicable codes.
4. In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures : use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
5. Closeout Submittals:
    1. Provide required operation and maintenance data.
    2. Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
    3. Maintenance data to include:
        a. Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
        b. Data to include schedules of tasks, frequency, tools required and task time.
    4. Approvals:
        a. 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.
        b. Make changes as required and re-submit as directed by Departmental Representative.

5. Additional data :
   a. Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
6. Site records :
   a. 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.
   b. Use different colour waterproof ink for each service.
   c. Make available for reference purposes and inspection.
7. As-built drawings :
   a. Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
   b. 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).
   c. Submit to Departmental Representative for approval and make corrections as directed.
   d. Perform testing, adjusting and balancing for HVAC using as-built drawings.
   e. Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
8. Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

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

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

1.4 DELIVERY, STORAGE, AND HANDLING

1. Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 CLEANING

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

3.2 FIELD QUALITY CONTROL

1. Site Tests: conduct following tests in accordance with Section [01 45 00 - Quality Control] and submit report as described in PART 1 - SUBMITTALS.

2. Manufacturer's Field Services:
    1. Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
    2. Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
    3. Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.3 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 SECTION INCLUDES

1. Materials and installation for copper domestic water service used in the following:
    1. Copper incoming domestic water service, up to NPS 2 1/2.
    2. Hard drawn copper domestic hot and cold water services inside building.
    3. Soft copper tubing inside building.

1.2 REFERENCE

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 A 307-03, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
    2. ASTM B 88M-03, Standard Specification for Seamless Copper Water Tube (Metric).
    3. ASTM F 492-95, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.
3. American Water Works Association (AWWA).
    1. AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
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) - 1995.

1.3 SUBMITTALS

1. Submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Submit product data for following: valves
3. Provide maintenance data.

PART 2 - PRODUCTS

2.1 PIPING

1. Domestic hot, cold and recirculation systems, within building.
   1. Above ground: copper tube, hard drawn, type K ou L : to ASTM B 88M.

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: roll grooved to CSA B242.

2.3 JOINTS

1. Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
2. Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.
3. Solder: 95/5 tin copper alloy.
4. Teflon tape: for threaded joints.
5. Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
6. Dielectric connections between dissimilar metals: dielectric fitting to ASTM F 492, 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.
2. NPS 2 and under, screwed:
    1. To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

2.5 BALL VALVES

1. NPS 2 and under, screwed:
    1. Class 150.
    2. Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and BunaN seat, steel lever handle as specified Section 23 05 22 - 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 BunaN seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 22 - Valves - Bronze.

2.6 BUTTERFLY VALVES

1. NPS 2-1/2 and over, lug :
    1. To MSS-SP-67, Class 200.
    2. Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
    3. Lever operated.

PART 3 - EXECUTION

3.1 INSTALLATION

1. Install in accordance with Province Plumbing Code.
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.

3.2 VALVES

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

3.3 PRESSURE TESTS

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

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. 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 START-UP

1. Timing: Start up after:
    1. Pressure tests have been completed.
    2. Certificate of static completion has been issued.
    3. 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. Check control, limit, safety devices for normal and safe operation.
4. Rectify start-up deficiencies.

3.7 PERFORMANCE VERIFICATION

1. Timing:
    1. After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

2. Procedures:
    1. Verify that flow rate and pressure meet Design Criteria.
    2. TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
    3. Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
    4. 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.
    5. Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

1.2 REFERENCES

1. ASTM International Inc.
    1. ASTM D 2235-[04], Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
    2. ASTM D 2564-[04e1], Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
2. Canadian Standards Association (CSA International)
    1. CAN/CSA-Series B1800-[06], Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
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).
5. South Coast Air Quality Management District (SCAQMD), California State
    1. SCAQMD Rule 1168-[A2005], Adhesive and Sealant Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

1. Provide submittals in accordance with Section [01 33 00 - Submittal Procedures].
2. Product Data:
    1. Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 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 MATERIAL

1. Maximum VOC limit [70] [250] g/L [to SCAQMD Rule 1168] [GSES GS-36] and in accordance with Section [01 35 21 - LEED Requirements].

2.2 PIPING AND FITTINGS

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

2.3 JOINTS

1. Solvent weld for PVC: to ASTM D 2564.
2. Solvent weld for ABS: to ASTM D 2235.

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 Provincial Plumbing Code.

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