

**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 include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1    Indicate on drawings:
    - .1    Mounting arrangements.
    - .2    Operating and maintenance clearances.
  - .2    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 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 components.
    - .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.
  - .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 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 prints as required for each phase of work. Mark changes as work progresses and as changes occur.
  - .2 Transfer information to reproducible, revising reproducible to show work as actually installed.
  - .3 Use different colours 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 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 Replace defective or damaged materials with new.

### **Part 2 Products**

#### **2.1 NOT USED**

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**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of the 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 Departmental Representative.

**3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 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 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 -ACTION AND INFORMATIONAL 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 - ACTION AND INFORMATIONAL 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.

**3.5 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.

**3.6 PROTECTION**

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

**END OF SECTION**



**Part 1            General**

**1.1                REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15, Cast Cooper Alloy Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .4 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .2 ASTM International
  - .1 ASTM B42, Seamless Copper Tube, Standard Sizes.
  - .2 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC S101, Fire Endurance Tests of Buildings Construction and Materials.
  - .2 CAN/ULC S102.2, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.
  - .3 CAN/ULC S115, Standard Method of Fire Tests of Firestop.
- .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-67, Butterfly Valves.
- .6 National Research Council (NRC)
  - .1 National Plumbing Code of Canada (NPC) 2015.

**Part 2            Products**

**2.1                PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground:
    - .1 Copper tube, hard drawn, type L: to ASTM B88M.

**2.2                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:
  - .1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
  - .2 PEX fittings to CSA B137.5 and F1960.

- .6 NPS 1 ½ and smaller:
  - .1 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, 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5.
- .4 Teflon tape: for threaded joints.
- .5 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 as specified Section.

## **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.
- .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 and Standard Council of Canada (SCC) standards.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

### **3.3 PRESSURE TESTS**

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

### **3.4 START-UP**

- .1 Timing: start up after:
  - .1 Pressure tests have been completed.
- .2 Provide continuous supervision during start-up.

- .3 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
- .4 Rectify start-up deficiencies.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 ASTM International Inc.
  - .1 ASTM B32, Standard Specification for Solder Metal.
  - .2 ASTM B306, Standard Specification for Copper Drainage Tube (DWV).
  - .3 ASTM C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
  - .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
  - .3 CAN/CSA-B125.3, Plumbing Fittings.
- .3 National Research Council Canada (NRC)
  - .1 National Plumbing Code of Canada 2015 (NPC).

**Part 2 Products**

**2.1 CAST IRON PIPING AND FITTINGS**

- .1 Above ground storm: to CAN/CSA-B70.
  - .1 Joints:
    - .1 Hub and spigot:
      - .1 Caulking lead: to CSA B67.
    - .2 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 INSTALLATION**

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance with National Plumbing Code.

**3.3 TESTING**

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

**3.4 PERFORMANCE VERIFICATION**

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

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCE STANDARDS**

- .1            ASTM International
  - .1            ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2            ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2            CSA International
  - .1            CSA B79, Commercial and Residential Drains and Cleanouts.
- .3            National Research Council Canada (NRC)
  - .1            National Plumbing Code of Canada 2015 (NPC).

**Part 2            Products**

**2.1                ROOF DRAINS**

- .1            See architecture

**2.2                CLEANOUTS**

- .1            Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

**2.3                Frost proof outlets, wall mounted**

- .1            Wall type, recessed box, chrome finish with vacuum breaker, outlet for flexible hose, operation key. NPS 20 mm.

**2.4                WATER HAMMER ARRESTORS**

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

**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 (NPC).
- .2            Install in accordance with manufacturer's instructions and as specified.

**3.3 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.

**3.4 NON-FREEZE WALL HYDRANTS**

- .1 Install 600 mm above finished grade.

**3.5 WATER HAMMER ARRESTORS**

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

**3.6 TESTING AND ADJUSTING**

- .1 General:
- .2 Cleanouts:
  - .1 Verify covers are gas-tight, secure, yet readily removable.
- .3 Wall, ground hydrants:
  - .1 Verify complete drainage, freeze protection.
  - .2 Verify operation of vacuum breakers.

**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**