

**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 and 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.
  - .3 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.

**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 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.
  - .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 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 off ground indoors 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 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

3.2      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 REFERENCE STANDARDS**

- .1 The Instrumentation, Systems and Automation Society (ISA)
  - .1 ISEA Z358.1-2014, Emergency Eyewash and Shower Equipment.
- .2 National Research Council Canada (NRC)
  - .1 National Plumbing Code of Canada 2015 (NPC).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**PART 2 - PRODUCTS****2.1 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 or stainless steel square or round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor Access: rectangular or round cast iron body and frame with adjustable secured nickel bronze top or cast box with anchor lugs and:
    - .1 Plugs: bolted bronze with neoprene gasket.
    - .2 Cover for Unfinished Concrete Floors: cast iron or nickel bronze round or square, gasket, vandal-proof screws.
    - .3 Cover for Terrazzo Finish: polished nickel bronze or brass with recessed cover for filling with terrazzo, vandal-proof locking screws.
    - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
    - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

**2.2 EMERGENCY WATER MIXING VALVE FOR EYE/FACE WASH**

- .1 General:
  - .1 The emergency eye/face wash mixing valve shall control and maintain the temperature of the water to the station. Unit shall be self contained and include a thermostatic water mixing valve, a dial thermometer on the outlet, angle checkstops, wall mounting bracket, piping and fittings factory assembled and tested, top or bottom inlets and top outlet, unit set for 29°C and a maximum temperature of 32°C. Unit must be able to be set to the correct temperature for the specific contaminant but must be locked in place to prevent changing of the temperature by accident. Unit shall be able to flow a minimum flow of 15 L/min. at 205 kPa.

- .2 Construction:
  - .1 Solid bimetal thermostat directly linked to valve porting to control the intake of hot and cold water and compensate for supply temperature and pressure fluctuations.
  - .2 Locking temperature regulator to prevent accidental movement set for 29°C.
  - .3 Mixing valve to close down on failure of cold water supply.
  - .4 Internal cold water bypass capable of a minimum of 15 L/min. at 205 kPa upon failure of hot water supply.
  - .5 Adjustable high temperature limit stop.
  - .6 Integral wall support.
  - .7 Full 13 mm bottom inlets and 13 mm top outlet.
  - .8 Rough bronze finish.
  - .9 Dial thermometer (range -10 to 60°C).
  - .10 Angle checkstops on inlets.
  - .11 Compliance with ISEA Z358.1.
  - .12 Maximum supply temperature 82°C.
  - .13 Maximum supply pressure 860 kPa.

## 2.3 EMERGENCY WATER MIXING VALVE FOR DRENCH OR COMBINATION EMERGENCY SHOWER

- .1 General:
  - .1 The Emergency shower mixing valve shall control and maintain the temperature of the water to the station . Unit shall be self contained and include a thermostatic water mixing valve, a dial thermometer on the outlet, union angle checkstops, wall mounting bracket, piping and fittings factory assembled and tested, top or bottom inlets and top outlet, unit set for 29°C and a maximum temperature of 32°C. Unit must be able to be set to the correct temperature for the specific contaminant but must be locked in place to prevent changing of the temperature by accident. Unit shall be able to flow a minimum flow of 76 L/min. at 205 kPa.
- .2 Construction:
  - .1 Solid bimetal thermostat directly linked to valve porting to control the intake of hot and cold water and compensate for supply temperature and pressure fluctuations.
  - .2 Thermostatic mixing valve can be set to the correct temperature for the application.
  - .3 Locking temperature regulator to prevent accidental movement set for 29°C.
  - .4 Mixing valve will close down on failure of cold water supply.
  - .5 Mixing valve with special internal cold water bypass capable of 76 L/min. at 205 kPa upon failure of hot water supply.
  - .6 Adjustable high temperature limit stop.
  - .7 Full 20 mm bottom inlets and 25 mm top outlet.
  - .8 Integral wall support.
  - .9 View port in door with, dial thermometer (range -10 to 60°C).
  - .10 Rough bronze finish.
  - .11 Exposed stainless steel cabinet with hinged door and cylinder lock.
  - .12 Union angle checkstops on inlets.
  - .13 Compliance with ISEA Z358.1.

## **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), Ontario codes, and local authority having jurisdiction.
- .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.

END OF SECTION

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 23 05 05 - Installation of Pipework.
- .2 Section 23 05 23.01 - Valves - Bronze.

**1.2 REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers International (ASME)
  - .1 ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .4 ASME B16.24-2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
  - .1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .2 ASTM B88M-16, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American Water Works Association (AWWA)
  - .1 AWWA C111/A21.11-17, 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 National Research Council (NRC)
  - .1 National Plumbing Code of Canada 2015 (NPC).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**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 L: to ASTM B88M, in long lengths and with no buried joints.

**2.2 FITTINGS**

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ASME B16.24.

- .2 Cast bronze threaded fittings, Class 125: to ASME B16.15.
- .3 Cast copper, solder type: to ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ASME B16.22.
- .5 NPS 2 and larger: ASME B16.18 or ASME B16.22 roll grooved to CSA B242.
- .6 NPS 1½ and smaller: wrought copper to ASME B16.22 ; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

### 2.3 JOINTS

- .1 Rubber gaskets, latex-free, 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 lead free.
- .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, 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 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.

## **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, OBC, Plumbing Code and local authority having jurisdiction.



- .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 ASME standards.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

### 3.3 VALVES

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

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 23 05 05 - Installation of Pipework.

### **1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA B1800-15, Thermoplastic Nonpressure Pipe Compendium.
- .2 National Research Council Canada (NRC)
  - .1 National Plumbing Code of Canada 2015 (NPC).

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **PART 2 - PRODUCTS**

### **2.1 PIPING AND FITTINGS - PLASTIC**

- .1 Corrosion resistant laboratory drainage and vent system shall be manufactured from blue pigmented high impact, co-polymer polypropylene.
- .2 Pipe and fittings to have a schedule 40 wall thickness and shall be certified to CSA B1800.

### **2.2 JOINTS - PLASTIC**

- .1 Joints shall be Cee Jay (CJ) compression joints with male threaded bodies, lock nuts, polyethylene seals and stainless steel lock rings.

### **2.3 FIRE STOPS**

- .1 Fire stops as recommended by manufacturer.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance with National Plumbing Code, Ontario Plumbing Code and local authority having jurisdiction.

### 3.2 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 (sanitary, vent) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

**PART 1 - GENERAL****1.1 REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B16.5-2017, Pipe Flanges and Flanged Fittings.
  - .2 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.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**PART 2 - PRODUCTS****2.1 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.
  - .2 NPS 2½ and larger: to ASME B16.11, schedule 80 steel, butt or 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 2½ 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 NPS 2½ and larger: butt welded.

**2.2 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 or screwed ends, carbon steel ball and associated trim suitable for compressed air application.
  - .2 To withstand 1034 kPa maximum pressure.

### 2.3 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 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

- .1 Install shut-off valves at outlets, major branch lines and in locations as indicated.
- .2 Install quick-coupler chucks and pressure gauges on drop pipes.
- .3 Install unions to permit removal or replacement of equipment.
- .4 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.
- .5 Grade piping at 1% slope minimum.
- .6 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.
- .7 Make branch connections from top of main.

END OF SECTION