

## PART 1 - GENERAL

### 1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 28 - Health and Safety Requirements.
- .3 Section 01 74 22- Construction/Demolition Waste Management Disposal.
- .4 Section 01 78 00 - Closeout Submittals.
- .5 Section 23 05 00 - Common Work Results - Mechanical.
- .6 Section 23 05 01 - Installation of Pipework.
- .7 Section 23 05 22 - Valves - Bronze.
- .8 Section 23 05 23 Valves - Cast Iron: Gate, Globe, Check.
- .9 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

### 1.2 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.
- .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).
- .7 Material Safety Data Sheets (MSDS):
  - .1 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.
- .9 Transport Canada (TC):
  - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

### 1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for following: valves.
- .3 Coordinate submittal requirements and provide submittals required.
- .4 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### 1.4 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

### 1.5 STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management & Disposal.

### 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management & Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Separate for reuse and recycling and place in designated containers, Steel, Metal and Plastic waste in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA and Regional and Municipal regulations.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

## 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.

### 2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: 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.

.6 Brass (for PEX piping) to CSA B1375.

### 2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, 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 F492, complete with thermoplastic liner.

### 2.4 BALL VALVES

- .1 NPS 2 and under, screwed:
  - .1 Class 150.
  - .2 Bronze body, chrome plated brass, stainless steel ball, PTFE adjustable packing, brass gland and PTFE, BunaN seat, steel lever handle as specified Section 23 05 22 - Valves - Bronze.
  - .3 Acceptable Manufacturer:
    - Crane 9322
    - Jenkins 902A
    - Red & White 5049
    - Kitz 59
    - Milwaukee BA-150
    - Newman Hattersley 1979
    - Nibco S-FP600
- .2 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronze body, chrome plated brass, stainless steel ball, PTFE adjustable packing, brass gland and PTFE BunaN seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 22 - Valves - Bronze.
  - .3 Acceptable Manufacturer:
    - Crane 9302
    - Jenkins 901A
    - Red & White 5044
    - Kitz 58
    - Milwaukee BA-100
    - Newman Hattersley 1969
    - Nibco T-FP600

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- .1 Install piping close to building structure to minimize furring and to conserve headroom and space. Group exposed piping and run parallel to walls.
- .2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding
- .3 Ensure that copper tubing does not come in contact with concrete grouting, mortar, etc. to prevent chemical reaction between dissimilar materials.
- .4 Install dielectric unions where piping of dissimilar metals is joined.
- .5 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment, reducing bushings are not permitted.
- .6 Install in accordance with NPC-2005 and local authority having jurisdiction.
- .7 Install pipe work in accordance with Section 23 05 01 - Installation of Pipework, supplemented as specified herein.
- .8 Assemble piping using fittings manufactured to ANSI standards.
- .9 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.
- .10 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .11 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 lockshield globe valves. Mark settings and record on as-built drawings on completion.

### 3.3 PRESSURE TESTS

- .1 Conform to requirements of Section 23 05 00 - Common Work Results - Mechanical.
- .2 Test pressure: greater of 1 times 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 copper to Provincial or Federal 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 authority having jurisdiction.
- .2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

### 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 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 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, verifying that no residuals remain as a result of flushing and/or cleaning.
- .3 Reports:
  - .1 In accordance with Section 01 91 00 - Commissioning: Reports, using report forms as specified in Section 01 91 00 - Commissioning: Report Forms and Schematics.
  - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.
- .4 Verification requirements include:
  - .1 Low-emitting materials.

**END OF SECTION**

## PART 1 - GENERAL

### 1.1 REFERENCES

- .1 CSA B51-M1991, Boiler, Pressure Vessel and Pressure Piping Code.
- .2 CSA C22.2 No. 110-M90, Construction and Test of Electric Storage Tank Water Heaters.
- .3 CSA C191 Series-M90, CSA Standards on Performance of Electric Storage Tank Water Heaters.
- .4 National Research Council (NRC)/ Institute for Research in Construction:
  - .1 Model National Energy Code for Buildings (MNECB) - 1997.

### 1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate:
  - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.
  - .2 Provide maintenance data for incorporation into manual specified in Section 01 78 00 Closeout Submittals.

## PART 2 - PRODUCTS

### 2.1 DHW TANKS

- .1 General: Condensing, power vented unit to CSA International certified to the latest edition of ANSI Z21.10.3 - 4.3 CSA Standards for use with potable water and space heating. Water heater to have a combined vent capabilities of 36m on the exhaust and 36m on the air inlet.
- .2 Capacity: as indicated
- .3 Tank: 444 Stainless Steel, 50mm non-CFC foam insulation, galvanized steel outer jacket, hose threaded drain valve, ASME rated temperature and pressure relief valve.
- .4 Combustion chamber: Submerged and rated for 1034 kPa

- .6 Trim:
  - .1 Listed concentric air intake and vent outlet pipe.
  
- .7 Controls:
  - .1 Operating controls shall have a 24-volt integrated control circuit, an immersed thermistor temperature sensor, a recycling energy cut-off switch, external temperature adjustment, and shall have LED lights that continuously indicate the operational status of the water heater. A microprocessor shall automatically monitor nine critical operating functions and signal the status of each.
  
- .8 Air Intake and Vent Piping:
  - .1 Schedule 40 PVC certified to ULC-S636 Type BH Gas Venting System.
  
- .9 Acceptable Manufacturers:
  - A.O. Smith
  - GSW
  - John Wood
  - American Water Heater

## 2.2 ACID NEUTRALIZATION CARTRIDGE

- .1 General: Designed to raise the pH of condensate from high efficiency boilers and water heaters.
- .2 Capacity: Raises the pH of condensate by 1-3 at 7.6 LPH.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations, CSA B149.1 and authority having jurisdiction.
- .2 Install intake and vent piping to manufacturer's recommendations and CSA B149.1. Slope 21mm per m (1/4" per ft) down to water heater. Support horizontal pipe every 1.2m and vertical pipe every 1.8m.

**END OF SECTION**

## PART 1 - GENERAL

### 1.1 RELATED SECTIONS

- .1 Related Sections:
  - .1 Section 01 33 00 - Submittal Procedures.
  - .2 Section 01 35 29 - Health and Safety Requirements.
  - .4 Section 01 78 00 - Closeout Submittals.
  - .5 Section 01 91 13 - General Commissioning Requirements.

### 1.2 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.

### 1.3 SUBMITTALS

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

- .2 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 Shop Drawings:
  - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, 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.

#### 1.4 QUALITY ASSURANCE

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.
  - .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 as approved by Departmental Representative.
  - .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

## PART 2 - PRODUCTS

### 2.1 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series.
- .2 Atmospheric vacuum breaker.
- .3 Acceptable Manufacturer:
  - Watts 288A

### 2.2 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Bronze construction complete with integral backflow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.
- .2 Acceptable Manufacturer:
  - HB-1: Boiler Drain Nibco 74
  - HB-2: Angel Sillcock Valve Nibco 63.

### 2.3 Y-TYPE STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removeable screen.
- .2 NPS 2 and Under: bronze body, screwed ends, with brass cap.  
Acceptable Manufacturer:
  - Armstrong F4SC
  - Conbraco
  - Crane 988-1/2
  - Watts 777 Series
- .3 NPS 2-1/2 and Over: cast iron body, flanged ends, with bolted cap.  
Acceptable Manufacturer:
  - Armstrong
  - Conbraco
  - Crane
  - Watts

## 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 2005 edition and local authority having jurisdiction except where specified otherwise.
- .2 Install in accordance with manufacturer's instructions and as specified.
- .3 Provide access doors for all concealed plumbing specialties if not accessible by other means. Access doors to be provided and installed in accordance with Section 08 31 19 - Access Doors - Mechanical.

### 3.3 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Install at bottom of risers, at low points to to drain systems, and as indicated.

### 3.4 STRAINERS

- .1 Install with sufficient room to remove basket.

### 3.5 START-UP

- .1 General:
  - .1 In accordance with Section 01 91 13 - General Commissioning Requirements, supplemented as specified herein.
  - .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.

### 3.6 TESTING AND ADJUSTING

- .1 General:
  - .1 In accordance with Section 91 13 - General Commissioning Requirements, supplemented as specified.
- .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: +/- 70kPa.
  - .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 Strainers:
  - .1 Clean out repeatedly until clear.
  - .2 Verify accessibility of cleanout plug and basket.
  - .3 Verify that cleanout plug does not leak.
  
- .6 Commissioning Reports:
  - .1 In accordance with Section 01 91 13 - General Commissioning Requirement Reports, supplemented as specified.
  
- .7 Training:
  - .1 In accordance with Section 01 79 00 -Demonstration and Training.
  - .2 Demonstrate full compliance with Design Criteria.

**END OF SECTION**