

## **PART 1 - GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)
  - .1 Material Safety Data Sheets (MSDS).

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **PART 2 - PRODUCTS**

### **2.1 SUMP PUMP**

- .1 Operating Conditions:
  - .1 Each drain pump shall be rated at 1/3 hp, 120 Volts, single phase, 60 Hz. 3450 RPM. The unit shall produce 0.6 L/s at 50 kPa of total dynamic head. The drain pump shall be capable of handling effluent with 9 mm solid handling capability. The pump shall be controlled with a piggy back style on/off float switch.
- .2 Construction:
  - .1 Pump shall be CSA certified and motor housing shall be constructed of a deep finned powder coated aluminum. Motor housing shall be oil filled to dissipate heat. Air filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and sealed with a Buna-N o-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with an engineered double lip seal with stainless steel springs. The tank shall be made of polypropylene.
- .3 Electrical Power Cord:
  - .1 Pump shall be supplied with 3 m of multiconductor power cord Type SJTW, capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly, with molded pins to conduct electricity.
- .4 Motor:
  - .1 Single phase motor shall be oil filled, permanent split capacitor, Class B insulated, NEMA B design, rated for continuous duty. At maximum load the winding temperature shall not exceed 130 degrees C unsubmerged. Since air filled motors are not capable of dissipating heat they shall not be considered equal. The pump motor shall have an integral thermal overload switch in the windings for protecting the motor. The capacitor circuit shall be mounted internally in the pump.
- .5 Bearings and Shaft:
  - .1 Upper and lower ball bearings shall be required. The bearings shall be a single ball / race type bearing. Both bearings shall be permanently lubricated by the oil, which fills the motor housing. The motor shaft shall be made of 300 or 400 series stainless steel and have a minimum diameter of 7.9 mm.

- .6 Seals:
  - .1 Pump shall have an engineered double lip seal with stainless steel springs. Motor plate /housing interface shall be sealed with a Buna-N o-ring.
- .7 Impeller:
  - .1 Impeller shall be molded engineered polymer, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be threaded to the motor shaft.
- .8 Controls:
  - .1 All units are supplied with CSA and UL approved automatic wide angle tilt float switches. The switches shall be equipped with piggy back style plug that allows the pump to be operated manually without the removal of the pump in the event that a switch becomes inoperable. The switches shall be mounted under a separately sealed access cover and tethered to a removable stainless steel rod for easy removal and serviceability.
- .9 Paint
  - .1 The exterior of the casting shall be protected with powder coat paint.
- .10 Support:
  - .1 The polyolefin tank shall be a free standing unit.

### **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 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Provide isolation and check valve on discharge pipe as per plumbing code.

#### **3.3 START-UP**

- .1 General:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
  - .2 Procedures:
    - .1 Check power supply.
    - .2 Check starter O/L heater sizes.
    - .3 Start pumps, check impeller rotation.
    - .4 Check for safe and proper operation.
    - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
    - .6 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

3.4 PV - SANITARY PUMPS

- .1 Application tolerances:
  - .1 Flow: plus 10%; minus 0%.
  - .2 Pressure: plus 10%; Minus 5%.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 21 05 01 - Common Work Results for Mechanical.
- .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 Copper Alloy 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
  - .1 ASTM A307-14, 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 National Research Council (NRC)
  - .1 National Plumbing Code of Canada (NPC) 2015.
- .5 Standard Council of Canada (SCC).

### **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:
    - .1 Copper tube, hard drawn, type L : to ASTM B88M.

### **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 1½ and smaller:
  - .1 Wrought copper to ASME B16.22 or cast copper to 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 1.6 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 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

### 2.4 BALL VALVES

- .1 Refer to 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, Ontario 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 and Standard Council of Canada (SCC) standards.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Valves
  - .1 Isolate equipment, fixtures and branches with gate, butterfly, 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 21 05 01 - Common Work Results for Mechanical.

### **1.2 REFERENCE STANDARDS**

- .1 ASTM International Inc.
  - .1 ASTM D2564-12, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA B1800-15, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3 National Research Council Canada (NRC)
  - .1 National Plumbing Code of Canada 2015 (NPC).
- .4 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
  - .2 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop Systems.

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

- .1 Provide submittals in accordance with Section 21 05 01 - Common Work Results for Mechanical.

## **PART 2 - PRODUCTS**

### **2.1 PIPING AND FITTINGS**

- .1 Fire & smoke resistant coated DWV PVC (Polyvinyl Chloride) piping & fittings:
  - .1 Pipe and Fittings: Drain, waste and vent pipe and fittings shall be certified to CSA B181.2, shall be tested and listed in accordance with CAN/ULC S102.2 and clearly marked with the certification logo indicating a flame-spread rating not exceeding 25 and a smoke-developed classification not exceeding 50.
- .2 Firestopping Devices:
  - .1 All combustible pipe penetrations shall comply with the requirements described in the O.B.C. 3.1.9.4.(1) through (8) and provide a firestop system that has been Tested and Listed to the test Standard CAN/ULC S115 with a pressure differential of 50 Pa. In addition, the manufacturer shall provide a documentation confirming compliance with the Listed system.
- .3 Solvent Welding:
  - .1 Solvent cements shall be CSA certified and meet the requirements of ASTM D2564. One-step cement may be used for sizes from NPS 40 to 150. Two-step cement must be used in conjunction with primer on larger pipe sizes. Proper solvent cementing procedures must be followed at all times.
  - .2 The manufacturer, shall be consulted prior to installation for proper solvent welding procedures and proper solvent cement requirements.

### **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 National Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.
    - .1 BPVC-VIII B - 2017, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1.
    - .2 BPVC-VIII-2 B - 2017, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 2 - Alternative Rules.
    - .3 BPVC-VIII-3 B - 2017, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels.
  - .2 ASME B16.5-2017, Pipe Flanges and Flanged Fittings.
  - .3 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.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **PART 2 - PRODUCTS**

### **2.1 AIR COMPRESSOR**

- .1 General: Two stage, air-cooled, reciprocating, horizontal, tank-mounted, V-belt driven.
- .2 Valves: Quiet, quick acting, stainless disc valves.
- .3 Motor: standard protected, 5 hp, 575V/3Ph/60 Hz.
- .4 Control:
  - .1 Manual control with H-0-A starter switch.
  - .2 Pressure switch to cut out at 800 kPa and with minimum differential pressure.
- .5 Accessories: belt guard and pressure gauges.
- .6 Air intakes: complete with replaceable cartridge type intake filter and silencer.
- .7 Capacity: 9.5 L/s of free air. 1035 kPa at 1750 r/min.
- .8 Vibration isolation: 95% minimum efficiency.



## 2.2 AIR RECEIVER

- .1 Horizontal tank: to CSA B51, ASME Section VIII and provincial regulations, for working gauge pressure of 1375 kPa. Capacity: 300 L.
- .2 Inlet and outlet connections: NPS 3/4.
- .3 Accessories: adjustable pressure regulator, safety valve, 125 mm diameter gauge with pressure range of 0 to 1500 kPa, drain cock and automatic condensate trap.
- .4 Provincial inspector's certificate and label.
- .5 Finish: shop primed and painting.

## 2.3 REFRIGERATED AIR DRYER

- .1 Self-contained, hermetically sealed, complete with air cooled heat exchanger, compressor, automatic controls, moisture removal trap, wiring, piping and refrigerant charge.
- .2 Inlet and outlet connections to be factory insulated.
- .3 Capacity:
  - .1 8.5 L/s at an atmospheric dew point of 4 degrees C, 800 kPa and 35 degrees C inlet air at evaporator. 20 degrees C air to condenser.
  - .2 Size to operate at 40% of time at design capacity.
- .4 Electrical supply: 370 W, 120 V, 1 phase, 60 cycle.

## 2.4 COMBINATION FILTER-REGULATOR

- .1 Factory assembled, heavy-duty with mounting bracket and low pressure side relief valve.
- .2 Maximum inlet pressure: 800 kPa.
- .3 Operating temperature: minus 18 degrees C to plus 52 degrees C.
- .4 Filter element: 1 micron before dryer, 0.1 micron after dryer. Bowls: polycarbonate.
- .5 Pressure range in regulator: 34 kPa to 800 kPa.
- .6 Gauge range: 0 kPa to 1100 kPa.

## 2.5 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 2-1/2 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.
- .7 Joints:
  - .1 NPS 2 and smaller: socket welded.

## 2.6 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 ends, carbon steel ball and associated trim suitable for compressed air application.
  - .2 To withstand 1034 kPa maximum pressure.

## 2.7 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 LINE FILTER

- .1 Install on inlet and discharge line for refrigerated air dryer.

### 3.3 MAIN AIR PRESSURE REGULATORS

- .1 Install at air compressor station.

### 3.4 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

- .1 Install flexible connection at discharge of compressor.

- .2 Install shut-off valves at outlets, major branch lines and in locations as indicated.
- .3 Install quick-coupler chucks and pressure gauges on drop pipes.
- .4 Install unions to permit removal or replacement of equipment.
- .5 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.
- .6 Grade piping at 1% slope minimum.
- .7 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.
- .8 Make branch connections from top of main.
- .9 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.
- .10 Provide drain from refrigerated air dryer.
- .11 Weld steel piping in accordance with ASME code and requirements of authority having jurisdiction.

### 3.5 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
  - .1 Testing: 4 hours minimum, to 1100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 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.

## **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), provincial codes, and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

### **3.3 CLEANOUTS**

- .1 Install cleanouts at locations required code, and as indicated.

END OF SECTION