

Part 1 General**1.1 REFERENCES**

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Shop Drawings.
 - .1 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
- .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 Manufacturers name, type, model year, capacity and serial number.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list with names and addresses.

1.3 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 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:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products**2.1 CLEAN SEAWATER TRANSFER PUMP (PU3-MOS-TR0)**

- .1 Construction: closed-coupled, in-line centrifugal, all bronze construction, stainless steel shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings. Design for 1,034 kPa and 105 degrees C continuous service.
- .2 Supports: provide as recommended by manufacturer.
- .3 Performances: as indicated on drawings

2.2 SUBMERSIBLE SUMP PUMP (PU1-SAN-000 & PU2-SAN-000)

- .1 Construction: duplex CSA approved, fibre-reinforced plastic (FRP) housing, stainless steel stainless steel shaft, non-clog fibre-reinforced plastic impeller, mechanical shaft seal.
- .2 Discharge size: DN 80
- .3 Sump pit:
 - .1 High-density polyethylene (HDPE) c/w 6.35mm thick anti-slip stainless steel 304 cover.
 - .2 Inlet hub, discharge connection & vent connection and location as indicated, on the side of the sump pit.
 - .3 27mm pump power supply stubs (2) and 27mm control wires (1) stubs on the higher sump pit portion, on the side.
 - .4 Sump Pit shall be provided with a built-in flange for anchorage to structural.
 - .5 Sump Pit dimensions as indicated on drawings.
- .4 Control: by Div. 25, c/w ultrasonic level sensor and duplex control box.
- .5 Performances: as indicated on drawings

2.3 GRINDER PUMP (PU3-SAN-000 & PU4-SAN-000)

- .1 Capacity: as indicated.
- .2 Construction: duplex, vertical extended shaft, single stage centrifugal, designed to handle 50 mm solids and for sump depth of 2.5m, cast iron body, semi-open cast iron impeller, dynamically balanced, bronze bearings with automatic lubrication..
- .3 Motor: as indicated, drip-proof, with overload and under voltage protection.
- .4 Control: copper ball float operated heavy duty switch. Starter switch as indicated. Automatic electric alternator with selector relays to alternate both pumps. Adjustable float stops on stainless steel rod.
- .5 Alarm: audible and visual alarm located on control panel c/w dry contact for connectivity to Building Automation System, controlled by float switch.

- .6 Sump pit:
 - .1 Wound Fiberglass c/w heavy duty anti-slip steel cover.
 - .2 Inlet hub, discharge connection & vent connection and location as indicated, on the side of the sump pit.
 - .3 27mm pump power supply stubs (2) and 27mm control wires (1) stubs on the higher sump pit portion, on the side.
 - .4 Sump Pit shall be provided with a built-in flange for anchorage to structural.
 - .5 Sump Pit dimensions as indicated on drawings.

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 Ensure pump and motor assembly do not support piping.
- .3 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .4 Seal the power supply and automatic controls conduits of sanitary grinder sump pits in order to prevent odors migration.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Check power supply.
 - .2 Check starter protective devices.
- .2 Start-up, check for proper and safe operation.
- .3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.
- .4 Adjust flow from water-cooled bearings.
- .5 Adjust impeller shaft stuffing boxes, packing glands.

3.4 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 Start pumps, check impeller rotation.
- .3 Check for safe and proper operation.
- .4 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
- .5 Test operation of hands-on-auto switch.
- .6 Test operation of alternator.
- .7 Adjust leakage through water-cooled bearings.
- .8 Adjust shaft stuffing boxes.
- .9 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
- .10 Check base for free-floating, no obstructions under base.
- .11 Run-in pumps for 12 continuous hours.
- .12 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .13 Adjust alignment of piping and conduit to ensure full flexibility.
- .14 Eliminate causes of cavitation, flashing, air entrainment.
- .15 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .16 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .17 Verify lubricating oil levels.

3.5 PV – SUMP PUMPS

- .1 Application tolerances:
 - .1 Flow: plus 10%; minus 0%.
 - .2 Pressure: plus 10%; Minus 5%.
- .2 PV Procedures:
 - .1 Fill sump at rate slower than capacity of pump #1.
 - .2 Record levels at which pump #1 starts and stops. Determine flow rate by observing time taken to down water level.
 - .3 Fill sump at rate faster than capacity of pump #1 but slower than capacities of pumps #1 and #2 operating in parallel.
 - .4 Record levels at which pumps start and stop - water level rising and water level falling.
 - .5 Verify operation of alternator.
 - .6 Adjust water level controls as necessary.
 - .7 Fill sump at rate faster than capacities of pumps #1 and #2 operating in parallel.
 - .8 Record levels at pump starts and stops - water level rising and falling.
 - .9 Check operation of alternator.
 - .10 Adjust level controls as necessary.
 - .11 Check level at which high water level alarm starts and stops. Adjust as necessary.

- .3 Check removability of pumps for servicing without interfering with installation or operation of other equipment.
- .4 Verify non-clog capability and maximum size of solids, using procedures recommended by manufacturer.

3.6 REPORTS

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: reports, supplemented as specified.
- .2 Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information report forms.
 - .3 Pump performance curves (family of curves) with final point of actual performance.

3.7 TRAINING

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

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

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Research Council (NRC)/Institute for Research in Construction
 - .1 NRCC 38728, National Plumbing Code of Canada (NPC) - 2010.
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).
- .6 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B88M-05 (2011), Standard Specification for Seamless Copper Water Tube (Metric).
 - .2 ASTM A240/240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings: submit in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .4 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with CEPA , TDGA and Regional and Municipal regulations.

Part 2 Products**2.1 COPPER PIPING**

- .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 K: to ASTM B88M, in long lengths and with no buried joints.
- .2 Fittings
 - .1 Cast bronze threaded fittings, Class 250: to ANSI/ASME B16.15.
 - .2 Cast copper, solder type: to ANSI/ASME B16.18.
- .3 Joints
 - .1 Solder: tin-antimony copper silver.
 - .2 Teflon tape: for threaded joints.
 - .3 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.
- .4 Ball valves
 - .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, stainless steel 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 ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, stainless steel 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.

2.2 STAINLESS STEEL TUBING

- .1 Tubing
 - .1 Application: For empty conduits required for the electric heat tracing of the cold room floor, as identified on drawing M-200.
 - .2 All stainless steel tubing shall be flexible Corrugated Stainless Steel 304 Tubing, as per ASTM A240, uncoated. Pipe joints for the buried sections are not allowed. Tubing thickness to be 0.3mm.
 - .3 Inner diameter to be 26.9mm \pm 5mm, Outer diameter to be 33mm \pm 5mm.

2.3 PVC PIPING

- .1 Piping
 - .1 The simulator water filling line (clean seawater, PU3-MOS-TR0 entire system) and the discharge piping of sump pumps PU1-SAN-000 & PU2-SAN-000 from the sump pumps to the wastewater tank shall be manufactured from PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454-B (Type 1, Grade 1) as identified in ASTM D1784.
 - .2 All PVC pipe shall be Schedule 80 (IPS) conforming to ASTM D1785 and/or CAN/CSA B137.3 (material, schedule and pressure rating at 23°C).
 - .3 All PVC piping shall be marked as prescribed in ASTM D1785, NSF 14 and/or CAN/CSA B137.3 (material, schedule and pressure rating at 23°C).
- .2 Fittings
 - .1 Fittings shall be manufactured from PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454-B (Type 1, Grade 1) as identified in ASTM D1784.
 - .2 All fittings (threaded or socket) shall be PVC Schedule 80.
 - .3 All fittings must be third-party certified to NSF 14.
 - .4 In locations where PVC pipe will connect to existing metallic fittings a PVC-to-metal adapter shall be utilized with metal reinforcement (stainless steel belted). This adapter shall conform to the PVC pipe/fitting manufacturer's recommended guidelines for such a connection.
- .3 Joints
 - .1 Solvent weld for PVC: to ASTM D2564.
 - .2 PVC socket joints to be made in accordance with the manufacturer's instructions (including application of primer and solvent cement).
 - .3 PVC threaded joints to be made in accordance with the Manufacturer's instructions. Threaded joints shall use Teflon tape specifically made for plastic fittings. Teflon tape sealant, when compressed between threads, flows outward to achieve an effective seal against leakage. Teflon paste shall not be used.
 - .4 PVC piping sections, elbows and tees shall be solvent welded socket connections.
 - .5 All PVC components requiring service and/or replacement (including isolation ball valves, etc) shall be "True-Union" connections.

.4 PVC Ball Valve**.1 Material**

- .1 The valve body, stem, ball and unions shall be made of PVC compound which shall meet or exceed the requirements of cell classification 12454 according to ASTM D1784.

.2 Seats

- .1 The ball seats shall be made of Teflon (PTFE).

.3 Seals

- .1 The o-ring seals shall be made of EPDM.

.4 Connection**.1 Socket style**

- .1 The IPS socket PVC end connectors shall conform to the dimensional standards ASTM D2466 and ASTM D2467.

.5 Design Features

- .1 The valve shall be double blocking with union ends.
- .2 All size 12 mm through 100 mm shall be full port.
- .3 All size shall allow for bi-directional flow.
- .4 The valve body shall be single end entry with a threaded carrier (ball seat support).
- .5 The valve body shall have an expansion and contraction compensating groove on the molded end.
- .6 The valve body, union nuts, and carrier shall have deep square style threads for increased strength.
- .7 The ball shall be machined smooth to minimize wear on valve seats.
- .8 The stem design shall feature a shear point above the o-ring to maintain system integrity in the unlikely event of a stem breakage.
- .9 The handle shall incorporate a tool for adjustment of the threaded carrier.
- .10 The handle shall be reversible to allow for operation in tight places.

.6 Pressure Tested

- .1 All valves shall have been pressure tested in both the open and closed positions by the manufacturer.

.7 Pressure Rating

- .1 Valve sizes 12 mm through 50 mm shall be rated at 1624 kPa at 23 °C.

.8 Markings

- .1 All valves shall be marked to indicate size, material designation, and manufacturers name or trade mark.

.5 Cam and Groove Lever Quick Couplings**.1 General**

- .1 Material: Stainless Steel 316
- .2 Gasket: EPDM

- .3 Cam and Groove coupling shall be interchangeable with other manufacturers
- .2 Male Adapter (Part A or F): threaded connection
- .3 Female Coupler (Part C):
 - .1 90° lever arms
 - .2 Heavy Duty hose shank
- .4 Dust Cap
 - .1 90° lever arms
- .6 Inside and Outside Rubber Lined Hose
 - .1 Heavy duty lay flat hose for industrial operations. Circular woven jacket out of 100% high tenacity synthetic yarn, embedded in a vulcanized high grade Nitrile/PVC compound using a through-the-weave-extrusion process. Hose shall offers high resistance to salt water solutions
 - .1 Working Pressure Rating: 1 720 kPa (250 psi)
 - .2 Cold-resistant up to -35°C
 - .3 Heat-resistant up to +100°C
 - .4 Color:
 - .1 Fill hose: Blue
 - .2 Drain hose: Black
 - .5 Length: 7.6m (25 ft)
 - .6 Hose Clamp: Stainless steel 316 Crimp Ferrule.

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 all applicable Codes 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 ANSI standards.
- .4 Install piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Slope piping in direction of drainage.
- .7 Use eccentric reducers at pipe size change installed to provide positive drainage.

- .8 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .9 Flush out system prior to returning to operation.

3.3 PRESSURE TESTS

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

3.4 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.

3.5 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 Monitor piping systems for freedom of movement, pipe expansion as designed.
 - .4 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.6 OPERATION REQUIREMENTS

- .1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

3.8 EXISTING SYSTEMS

- .1 Execute work with least possible interference or disturbance to building operation, occupants, public and normal use of premises. Arrange with the Departmental Representative to facilitate execution of work.
- .2 Notify the Departmental Representative of intended interruption or shutdown of existing systems and obtain required permission.

- .3 Minimize duration of interruptions or operational down time of systems. Carry out work at times as directed by the Departmental Representative.
- .4 Establish location and extent of service lines in area of work before starting work. Notify the Departmental Representative of findings.
- .5 Submit schedule and obtain approval from the Departmental Representative for any shut-down of existing plumbing system. Adhere to approved schedule and provide notice to all affected parties.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 ASTM International Inc.
 - .1 ASTM D2564-2012, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-Series B1800-15, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-13, 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.

1.2 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.
 - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.
- .4 Packaging Waste Management: remove for reuse and return of pallets in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products**2.1 MATERIAL**

- .1 Adhesives and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

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 D2564.

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 Ontario all applicable codes and local authority having jurisdiction.

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 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.
- .4 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .5 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.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 ASTM International
 - .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-2015, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .3 D618, Conditioning Plastics and Electrical Insulating Materials for Testing D638 Tensile Properties of Plastics
 - .4 D790, Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - .5 D883, Definitions of Terms Relating to Plastics
 - .6 D1505, Density of Plastics by the Density-Gradient Technique
 - .7 D1525, Test Method for Vicat Softening Temperature of Plastics
 - .8 D1693, Test Method for Environmental Stress-Cracking of Ethylene Plastics
 - .9 D1998, Standard Specification for Polyethylene Upright Storage Tanks
 - .10 D2765, Degree of Crosslinking in Crosslinked Ethylene Plastics as Determined by Solvent Extraction
 - .11 D2837, Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
 - .12 D3892, Practice for Packaging/Packing of Plastics
 - .13 F412, Definitions of Terms Relating to Plastic Piping Systems
- .2 ARM (Association of Rotational Molders) Standards: Low Temperature Impact Resistance (Falling Dart Test Procedure)
- .3 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700-09, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C701-12, Standard for Cold Water Meters-Turbine Type for Customer Service.
 - .3 ANSI/AWWA C702-15, Standard for Cold Water Meters-Compound Type.
- .4 CSA International
 - .1 CSA-B64 Series-16, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79-13, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356-15, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .5 Efficiency Valuation Organization (EVO)
 - .1 International Performance Measurement and Verification Protocol (IPMVP).
 - .1 IPMVP 2007 Version.

- .6 Plumbing and Drainage Institute (PDI)
 - .1 PDI-WH201-R2010, Water Hammer Arresters Standard.

1.2 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 for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. Indicate VOC's:
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .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.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
 - .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.
- .3 Tank manufacturers Guideline for Use & Installation is to be submitted to Departmental Representative for review and approval prior to manufacturing seawater clean and waste water tanks.
 - .1 Once installed, the tanks installer is to certify that the tank system has been installed according to the tank manufacturer's Guidelines for Use & Installation.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 EXTENDED WARRANTY

- .1 For the work of this Section 22 42 01 – Plumbing Specialties and Accessories, the 12 month warranty is extended to 24 months.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drains: to CSA B79.
- .2 Type 1: general duty; cast iron body round, adjustable head, sediment basket, nickel bronze strainer, integral seepage pan and clamping collar.
- .3 Type 2: combination funnel floor drain for floating floor: epoxy coated, cast iron upper and lower bodies, reversible membrane clamps with primary and secondary weepholes, neoprene movement compensator coupling, no hub outlet. 200 mm diameter epoxy coated ductile iron, heel-proof round grate, 100 mm x 230 mm oval cast iron funnel.
- .4 Type 3: combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.

2.2 CLEANOUTS

- .1 General: Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 AT-1: Scoriated, 305 mm x 305 mm square frame with secured cover, concealed mounting flanges, nickel bronze cover, for flush installation in concrete floor.

2.3 NON-FREEZE WALL HYDRANTS

- .1 Surface mount, with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Chrome plated finish.

2.4 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application reduced pressure principle type.
- .2 NPS 12 mm to NPS 50mm: bronze body with stainless steel flange bolts and rubber seats. Maximum pressure 1200 kPa, c/w two positive seating check modules, bronze bodies, captured spring assemblies, replaceable seats and silicone seat discs, single access bronze cover secured with stainless steel bolts, internal pressure differential relief valve in between check modules, two resilient seated isolation valves quarter turn ball-valves, 3/4"Ø (20 mm) pipe connection, four resilient seated screw driver slotted test cocks, bronze strainer, stainless steel ball valve handles, union connections, 1/2"Ø (15 mm) air gap drain fitting assembly and air gap device. Relief valve should be connected to the closest floor drain using the appropriate air gap device.

2.5 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric with hose connection.

2.6 STRAINERS

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS 2 and under, bronze body, screwed ends, with brass cap.

2.7 SERVICE SINK (SS-1)

- .1 Stainless steel service sink, 695 mm (27-3/8") wide x 691 mm (27-3/16") long x 889 mm (35") high, floor mounted. 16 GA (1.5 mm) type 316 stainless steel, rim and bowl polished satin finish, 229 mm (9") high backsplash, radius coved corner, rolled rim, stainless steel tubular legs with adjustable feet, 3-1/2" (89 mm) crumb cup waste assembly with 1-1/2" (38 mm) tailpiece.

2.8 SEDIMENT INTERCEPTOR (SI-1)

- .1 Built-in 19mm thick polypropylene solids interceptor, 189 liters (50 usgpm), including fixed baffle retaining solids, flow regulator, inverted "T" equipped with a cleanout and a slip-resistant bolted aluminum cover with sealing liner, 100mm (4") diameter connections and extension of a length adapted to site conditions. Sand interceptor shall be provided with a built-in flange for anchorage to structural floor.

2.9 COLD WATER FILTER (F1)

- .1 Manual backwash water filter, 20mm (3/4" Ø), 18 gpm (4.1 cubic meter/hr) flow rate, 2.9 psi (20kPa) pressure loss at backwash, 150psi (1034 Kpa) maximum flow pressure, upper housing made of high-grade polymer based materials and bottom housing made of high-grade cast iron coated with polyamide plastic resin. Filter to include a quick mounting device for easy installation in both horizontal and vertical flow, equipped with a clear sight-glass which allows you to view the filtration, dirt build-up and backwash function, 30 microns stainless steel filter sieve, manual backwash, operation by rotating top hand wheel process uses a patented point-of-rotation system without any interruption of water supply or filtration process. Simultaneous cleaning of sight glass during the backwash process, audible backwash reminder alarm, battery powered (AAA x 2), threaded connection to ANSI B1.20.1, CSA and NSF61 approval and certification for domestic potable water supplies, Run backwash flush connection to nearest floor drain using an indirect connection.

2.10 CLEAN SEAWATER AND WASTE SEAWATER TANKS

- .1 General
 - .1 Contractor shall supply and install all materials, equipment, appurtenances, specialty items, and services required to provide an upright, single wall, flat bottom, closed top, polyethylene storage tank for storage of clean seawater and waste seawater (contaminated with low percentage of oil).
 - .2 Resin: Type I – Tanks molded from cross-linkable polyethylene resin (XLPE)
 - .1 A copy of the resin data sheet from the resin manufacturer for the tank is to be supplied and the tank manufacturer is to certify that it will be the resin used in the manufacture of the tank.

- .3 Each tank is to be molded in one-piece seamless construction according to ASTM D 1998 and will be capable of storing the chemical application at atmospheric pressure. The manufacturer is to have rotationally molded tanks based upon ASTM D 1998 utilizing Type I resins.
- .4 Wall thickness - Prior to the manufacture of the tank, the designed wall thickness audit is to be supplied based upon 4,137 kPa hoop stress (ASTM D 1998) at 37.7 degrees C. Fluid specific gravity to be 1.9.
- .5 All polyethylene resin material shall contain a minimum of a U.V. 15 stabilizer as compounded by the resin manufacturer. Pigments may be added at the purchaser's request, but shall not exceed 0.25% (dry blended) of the total weight.
- .6 Factory Test Report: Upon completion of the tank the manufacturer's inspection report is to be supplied for each tank.
 - .1 Verification of wall thickness
 - .2 Impact test
 - .3 Gel test
 - .4 Hydrostatic test
 - .5 Verification of fitting placement
 - .6 Visual inspection
 - .7 Verification of materials
- .2 Dimensions
 - .1 Clean seawater tank
 - .1 Outside diameter: 2,286mm
 - .2 Outside height: 2,223mm
 - .3 Capacity: 7,570 L
 - .4 Brimful capacity: 7,950 L
 - .2 Waste seawater tank
 - .1 Outside diameter: 3,048mm
 - .2 Outside height: 2,523mm
 - .3 Capacity: 15,141 L
 - .4 Brimful capacity: 16,807 L
- .3 Piping connection locations (for reference, tank manway is located at 0°, degree markings are counter-clockwise per ANSI standard drafting specifications)
 - .1 Clean seawater tank
 - .1 Fill tube: 90°, 80mm diameter, located on the flat area on the top head of tank.
 - .2 Drain: 0°, 80mm diameter, located at bottom flat 165mm x 165mm area.
 - .3 Transfer pump: 90°, 50mm diameter, located at bottom on flat 165mm x 165mm area.

- .2 Waste seawater tank
- .1 Fill tube: 135°, 80mm diameter, located on the flat area on the top head of tank.
- .2 Drain: 0°, 80mm diameter, located at bottom flat 165mm x 165mm area.
- .4 Mechanical Properties of Type I tank material: Cross-linked (XLPE)
- | <u>PROPERTY</u> | <u>ASTM</u> | <u>VALUE</u> |
|--|-------------|---------------------|
| Density (Resin) | D1505 | 0.938-0.946 g/cc |
| Tensile (Yield Stress 50mm/min) | D638 | 19.5 MPa – 20.7 MPa |
| Elongation at Break (50mm/min.) | D638 | 700 - 800% |
| ESCR (100% Igepal, Cond. A, F50) | D1693 | >1000 hours |
| ESCR (10% Igepal, Cond. A, F50) | D1693 | >1000 hours |
| Vicat Softening Degrees C. Temperature | D1525 | 121 |
| Flexural Modulus | D790 | 600 – 758 MPa |
- .1 The tank's top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall. The top head shall be designed to provide a minimum of 0.8 sq.m. of flat area for fitting locations.
- .2 At bottom, the tanks shall have 165mm x 165mm flat area located on the side in order to allow for piping and fittings installation.
- .3 A minimum of 3 lifting lugs integrally molded into the top head is required for each tank. The lifting lugs shall be designed to allow erection of an empty tank.
- .5 Test Methods
- .1 Test specimens shall be taken from fitting location areas.
- .2 Low Temperature Impact Test
- .1 Test specimens shall be conditioned at (- 40) degrees Fahrenheit for a minimum of 2 hours.
- .2 The test specimens shall be impacted in accordance with the standard testing methods as found in ASTM D1998. Test specimens <13mm thickness shall be tested at 135 Nm. Test specimens >13mm thickness shall be tested at 270Nm.
- .3 Degree of Crosslinking Test (% Gel)
- .1 The test method used is to be the o-xylene insoluble fraction (gel test) per ASTM D2765 Method C. This test method is for determination of the ortho-xylene insoluble fraction (gel) of crosslinked polyethylene.
- .2 The percent gel level for Type I tanks on the inside 3mm. of the wall shall be a minimum of 65%.
- .4 Ultrasonic Tank Thickness Test
- .1 All tanks shall be measured for tank wall thickness at 150mm, 300mm, 600mm and 900mm on the tank sidewall height at 0° and 180° around the tank circumference with 0° being the tank manway and going counter-clockwise per ANSI standard drafting specifications. A copy of this test report will be required. All tanks shall meet design thickness requirements and tolerances.

- .5 Hydrostatic Water Test
 - .1 The hydrostatic water test shall consist of filling the tank to brim full capacity for a minimum of four hours and conducting a visual inspection for leaks. A hydrostatic water test is required.
- .6 Tank Accessories
 - .1 General
 - .1 Gaskets: EPDM
 - .2 Bolts: Stainless Steel 316
 - .2 Top Manway
 - .1 Constructed of polyethylene material. The bolts shall be polypropylene. The gaskets shall be closed cell, crosslinked polyethylene foam and Viton o-rings to seal the bolts.
 - .3 Ladders
 - .1 Ladders shall be constructed of galvanized mild steel.
 - .2 Safety cages shall be provided with ladders.
 - .3 All ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 2206; 1910.27; fixed ladders.
 - .4 Ladders must be mounted to the tank to allow for tank expansion and contraction due to temperature and loading changes. All top ladder mounts shall be connected to integrally molded in attachment lugs that allow for tank movement due to temperature and loading changes.
 - .5 Mild steel parts shall be deburred and galvanized.
 - .4 Vents
 - .1 Each tank must be properly vented for the type of material and flow rates expected.
 - .2 All tanks must be vented for atmospheric pressure as well as any pressure created by filling and emptying the tank.
 - .3 Venting equipment should be sized to limit pressure or vacuum in the tank to a maximum of 13mm of water column (138 Pa). (U-Vents to be 50mm dia. with mesh insect screening.
 - .4 All U-vents shall be constructed of PVC or other approved materials by Departmental Representative.
 - .5 Flexible Connections
 - .1 All tank fitting attachments shall be equipped with flexible couplers or other movement provisions provided by the Contractor. The tank will deflect based upon tank loading, water temperature and storage time duration. Tank piping flexible couplers shall be designed to allow 4% design movement. Movement shall be considered to occur both outward in tank radius and downward in fitting elevation from the neutral tank fitting placement.

- .2 The flexible connection is to be manufactured of the same material as the tank or a compatible material approved by the Departmental Representative. If an elastomer flexible connection is used, control bolts are required if recommended by the manufacturer. The flexible connection is to be designed for a minimum of 4% movement. The flexible connection is to be designed with 150# flange connections to allow for attachment to the tank and the piping system. The flexible connection is to be attached as close as possible to the tank to reduce stress.
- .3 The flexible connections shall have the ability to allow the pipe to withstand seismic movements in the building, for a 200mm deviation.
- .6 Siphon Tube: Schedule 40 PVC w/ Bulkhead Fitting, threaded w/EPDM Gasket (required for clean seawater tank only at transfer pump location).
- .7 Clean seawater tank fill pipe: External 80mm PVC piping, connected on top of tank, as indicated on drawings. Fill pipe to be supported at 915mm maximum intervals.
- .8 Ultrasonic Level Indicator
 - .1 Tanks to be provided with 25mm threaded flat connector on top of the tanks for the installation of an ultrasonic level indicator by Div. 25.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories 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 from Departmental Representative.

3.2 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.

3.3 INSTALLATION

- .1 Install in accordance with all applicable codes and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.
- .3 Install clean seawater tank and waste water tank as per manufacturer recommendations.
 - .1 Coordinate shape and size of the housekeeping pad with tank manufacturer requirements and site conditions.

3.4 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.
- .4 AT-1: Contractor to take special precautions so that the cover is exactly at the same level as the concrete floor.

3.5 NON-FREEZE WALL HYDRANTS

- .1 Install 300mm above service sink at 200mm center to center.

3.6 BACK FLOW PREVENTERS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .2 Pipe discharge to terminate over nearest funnel floor drain or service sink.

3.7 STRAINERS

- .1 Install with sufficient room to remove basket for maintenance.

3.8 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General 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.

3.9 TESTING AND ADJUSTING

- .1 General:
 - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13- General Commissioning (Cx) Requirements : General 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: +/- 70 kPa.
 - .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 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Check security, accessibility, removability of strainer.
 - .3 Clean out baskets.
- .6 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- .7 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Wall, hydrants:
 - .1 Verify complete drainage, freeze protection.
 - .2 Verify operation of vacuum breakers.
- .9 Pressure regulators, PRV assemblies:
 - .1 Adjust settings to suit locations, flow rates, pressure conditions.
- .10 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .11 Hose bibbs, sediment faucets:
 - .1 Verify that flow and pressure meet design criteria.
 - .2 Check for leaks, replace compression washer if required.
- .12 Hydronic system water Make-up Assembly:
 - .1 Verify flow, pressure, and connection.
- .13 Cold water filter:
 - .1 Verify location and reach.
 - .2 Check for leaks.

3.10 CLOSEOUT ACTIVITIES

- .1 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: reports, supplemented as specified.
- .2 Training: provide training in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O M Personnel, supplemented as specified.

3.11 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 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.12 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

