PART 1 GENERAL

1.1 Work Included

.1 This section specifies requirements for construction of Halifax Water Wastewater Pump Stations, including hatches, pumps, piping, supports, valves, and instrumentation (measuring devices). Work includes supply, installation, start-up and testing requirements of pump station equipment.

.2 The specifications apply to equipment and material which may be incorporated as parts of wet wells, drywells, buildings, chambers, and instrumentation systems that are part of a wastewater pump station.

.3 For the purposes of these specifications, wet wells, dry wells, buildings, and chambers begin at the first fitting on pipe entering or exiting these structures. Refer to other specification sections for buried piping, valves and other utilities.

1.2 Related Sections

.1 Concrete, Reinforcing & Formwork: Division 3.

.2 Miscellaneous Items: Section 33 39 00.

.3 Electrical Work: Division 26.

1.3 Intent of Specification

.1 These specifications are intended to define the requirements of common elements for the construction and installation of Halifax Water Wastewater Pump Stations and have been prepared for use in conjunction with the specifications provided in the latest version of The Standard Specifications for Municipal Services as published by the Joint Committee on Contract Documents. This specification replaces in whole Section 33 32 14 of the Standard Specification for Municipal Services.

1.4 References

.1 American Association of State Highway and Transportation Officials (AASHTO):

.1 AASHTO HB-2005, Standard Specification for Highway Bridges.

.2 American Boiler Manufacturers Association (ABMA):

.1 ABMA Standard 9-2015, Load Ratings and Fatigue Life for Ball Bearings.

.3 American Standard Testing Methods (ASTM):

.1 ASTM A48/A48M-2016, Standard Specification for Gray Iron Castings
.2 ASTM A108-2018, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
.3 ASTM A126-04(R2019), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
.4 ASTM A240/A240M-2020, Standard Specification for Chromium and chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
.5 ASTM A307-2014, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods, 60 000 PSI Tensile Strength.
.6 ASTM A536-84, Standard Specification for Ductile Iron Castings.
.7 ASTM A743/A743M-2019, Standard Specification for Castings, Iron Chromium, Iron Chromium-Nickel, Corrosion Resistant, for General Application.
.8 ASTM F3125/F3125M-2019, Standard Specification for High strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimension 830 MPa and 1040 MPa Minimum Tensile Strength.

.4 American Society of Mechanical Engineers (ASME):

.1 ANSI/ASME B16.1-2020, Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
.2 ASME B31.3-2018, Process Piping.

.5 American Waterworks Association (AWWA):

.1 AWWA C104/A21.4-16, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
.2 AWWA C110/A21.10-2012, Ductile Iron and Gray – Iron Fittings.
.3 AWWA C115/A21.15-2020, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
.4 AWWA C151/A21.5-2017, Iron, Centrifugally Cast.

.5 AWWA C508-17, Swing Check Valves for Waterworks Service, 2-in. Through 48 in. (50mm through 1200mm NPS).
.6 AWWA C509-2015, Resilient – Seated Gate Valve for Water Supply Service.
.7 AWWA C512-2015, Air-Release/Vacuum, and Combination Air Valves for Water and Wastewater Service.
.8 AWWA C517-2016, Resilient-Sealed Cast-Iron Eccentric Plug Valves.
.9 AWWA C520-2019, Knife Gate Valves, Sizes 50mm Through 2400mm.

.6 Canadian Standards Association (CSA):

.1 CSA C22.2 No. 100-2019, Motors and Generators.
.2 CSA C22.1-18, Canadian Electrical Code.

.7 Manufacturers Standardization Society (MSS):

.1 MSS SP-58-2018, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application and Installation.

.8 American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA):

.1 ANSI/NEMA MG1-2018, Motors and Generators.

.9 Canadian General Standards Board:

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

1.5 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 10 00.

.2 Indicate details of piping, valves, supports, pumps, performance data, metal fabrications, access hatches, electrical connections, and appurtenances.

1.6 CSA Approval

.1 All electro-mechanical equipment specified herein must be CSA certified.

1.7 Operating and Maintenance Data

.1 Provide operating and maintenance data in accordance with Section 01 10 00 and as follows:

.1 System description.
.2 Equipment data, material lists and diagrams.
.3 Performance curves for the pumps, wiring diagrams, and control system schematics, etc.
.4 Recommended maintenance procedures.
.5 Manufacturer's operating instructions.
.6 Name, address, and telephone number of equipment suppliers.
.7 Information on guarantees and warranties.

1.8 Warranty

.1 All pumps and motors must carry a minimum of 24 months warranty from the date pumps are placed into regular service.

1.9 Equipment Identification

.1 Fit equipment with the manufacturer's identification nameplates indicating size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power motors, all factory supplied.

PART 2 PRODUCTS

2.1 Dry Pit - Submersible Pumps

.1 Service: Submersible, solids handling, non-clog or grinder pumps installed in a dry well and suitable for handling raw, unscreened sanitary wastewater and capable of passing a 75mm spherical object.

.2 Pump characteristics:

.1 DUTY POINT #1 – X flow and X head
.2 DUTY POINT #2 – X flow and X head, if applicable
.3 PUMP SPEED – X (rpm) rated speed
.4 NPSHa – X (m) available NPSH
.5 SYSTEM STATIC HEAD - X (m) head
.6 INLET SIZE – X diameter
.7 OUTLET SIZE – X diameter
.8 PUMP MOTOR POWER – X rated power
.9 PUMP CONTROLLED ON VFD – X yes or X no
.10 REQUIRED LENGTH OF POWER/CONTROL CABLE – X (m)
.11 PUMP MODEL / NUMBER – X if applicable

.3 Pump unit to be capable of delivering flow and TDH, in accordance with Grade 1B tolerance of the HI (Hydraulic Institute) Standards.

.4 Supply each unit complete with manufacturer's recommended mounting requirements.

.5 Pump and motor to be close-coupled, integral design with Class 125 flanged connections to ANSI B16.1.

.6 Pump casing to be grey cast iron to ASTM A48, Class 35B, with smooth surfaces, devoid of blowholes and other irregularities. Exposed nuts and bolts to be 316L stainless steel.

.7 Impellers shall be "hardened" material with a minimum hardness of 60 HRC, dynamically balanced, non-clog or recessed design having a long throughlet without acute turns.

.1 Impeller: capable of handling solids, fibrous material, heavy sludge, and other matter found in normal sewage applications.
.2 Impeller vane design and passing sphere as indicated.
.3 Pump out vanes in the back of impeller shroud to be large enough to sufficiently expel solids away from seal area.

.4 Maximum sized impellers for given pump model are not acceptable.

.8 Wear rings or wear plates:

.1 To provide efficient sealing between volute and impeller, and consist of a stationary hard metal wear system**,** which is fitted to volute inlet. Wear rings to be of softer construction than impellers and must be removable and designed to compensate for normal wear encountered for the application

.9 Pump shaft and sleeve:

.1 Accurately machined and of sufficient size to transmit full power from driver.
.2 Shaft material to be ASTM A108 Grade 1045 steel.
.3 Protect shafts from wear by a chrome steel shaft sleeve to ASTM A743/743M A Gr. CA-15 325-400 BHN sealed to prevent leakage between sleeve and shaft.
.4 Provide each pump with a tandem mechanical shaft seal system.
.5 Tandem mechanical shaft seal to be of single spring design operating in an intermediate oil-filled seal cavity.
.6 The upper of the tandem set of seals operates in cooling medium. This set contains one (1) stationary ring and one (1) positively driven rotating ring.
.7 Seal materials: Tungsten-carbide or carbon-ceramic.

.10 Bearings: arranged to eliminate radial play and with a minimum B-10 life of 40,000 hours in accordance with ABMA Std. 9; grease lubricated with convenient tapped opening for routine lubrication. Bearings to be permanently greased, single roller type for the upper bearing and two (2) row angular contact type for the lower bearing.

.11 Electric motors:

.1 Pump motor: squirrel-cage induction type design, housed in a watertight or dielectric oil-filled chamber of maximum efficiency and durability. Provide a motor designed for continuous duty capable of sustaining a minimum of fifteen (15) starts per hour.
.2 Motor stator: directly shrink-fitted into the stator housing. Insulate stator winding and leads with moisture-resistant varnish capable of withstanding a temperature of 155°C or the motors maximum temperature rise, whichever is greater. Insulation rating to Class F or higher.
.3 Equip air-filled motor housing with a moisture detector to detect any leakage of liquid into the stator housing. Wire the signals from the thermal switches and the moisture detector to the control panel. Equip oil-filled motor housing with thermal switches only.

.4 Integrate moisture sensor detection system consisting of two (2) probes within the oil-filled seal chamber which is isolated from the motor chamber. This sensor will provide early warning of lower seal failure.

.5 Accomplish control of the moisture detector and the winding thermal switches by using a control/indicator relay(s) which will be installed and wired inside the control panel to stop the pump unit upon a fault signal.

.6 Motors to be air cooled or oil cooled to manufacturer's standard.

.7 Motor to be able to operate dry without damage while pumping under load.

.8 Appropriately match the motor to the speed and torque requirements of the proposed pump and confirm it is capable of continuous duty.

.9 Motors to comply with the latest edition of NEMA standard MG1, Motors and Generators, and CSA C22.2 No. 100, Motors, and Generators.

.10 The motors will be operated from a 600 volt, 3 phase, 60 Hz power supply. Voltage tolerance ± 10%.

.11 Motor to have a 1.15 service factor and be operable at the service factor load continuously without exceeding the insulation rated temperature rise at 40°C ambient.

.12 Pumps to be cooled with a water jacket around the stator casing. Provide a motor designed to operate up to 40°C ambient with a temperature rise not to exceed 80°C. Power cable to the motor to be CSA approved, sized for service, sealed at the pump entry by a compressed grommet/washer assembly and be continuous from pump to electrical panel.

.13 Motors to be inverter rated.

.14 On motors 112 kW (150 Hp) or larger provide:

.1 Vibration monitoring.

.2 RTD's three (3) on each motor windings.

.3 RTD's two (2) on upper and lower bearings.

.15 Motors and electrical assemblies must be suitable for use in a Zone 2 area as defined by the Canadian Electrical Code.

.12 Grinder pumps to have hardened stainless shredding ring and grinder to reduce sewage to a small size for discharge through small diameter piping.

.13 Power and/or control (monitoring) cable(s): neoprene-jacketed type SOW composite cable sized to meet or exceed electrical code requirements. Cable to be suitable for submerged use and CSA approved:

.1 Confirm cable entry design has an impermeable seal.

.2 Combine power, temporary sensing and moisture sensor conductors into a single cord. Cable to enter through a double grommet and internal strain relief to a terminal strip for conductor attachment. Cable entry design must be capable of continuous submergence underwater without loss of watertight integrity to a depth of 20 m.

.14 Acceptable Manufacturer: Xylem/Flygt, KSB or Sulzer.

2.2 Submersible Pumps

.1 Service: Submersible, solids handling, non-clog or grinder pumps installed in wet wells and suitable for handling raw, unscreened sanitary wastewater and capable of passing a 75mm spherical object.

.2 Pump characteristics:

.1 DUTY POINT #1 – X flow and X head.
.2 DUTY POINT #2 – X flow and X head, if applicable.
.3 PUMP SPEED – X (rpm) rated speed.
.4 NPSHa – X (m) available NPSH
.5 SYSTEM STATIC HEAD - X (m) head
.6 INLET SIZE – X diameter.
.7 OUTLET SIZE – X diameter.
.8 PUMP MOTOR POWER – X rated power.
.9 PUMP CONTROLLED ON VFD – X yes or X no.
.10 REQUIRED LENGTH OF POWER/CONTROL CABLE – X (m)
.11 PUMP MODEL / NUMBER – X if applicable.

.3 Pump unit to be capable of delivering flow and TDH, in accordance with Grade 1B tolerance of the HI (Hydraulic Institute) Standards.

.4 Supply each unit complete with a mating, cast iron discharge connection and stainless steel lifting chain or cable, approved for overhead lifting and of adequate strength to permit raising and lowering of the pump. Lifting system must be compatible with existing municipal lifting equipment.

.5 Pump and motor to be close-coupled, integral design with custom discharge connection. Install a discharge connection and elbow in wet well, together with the discharge piping.

.6 Pump to be on guiderails and shall automatically connect to discharge connection elbow when lowered into place, and easily removed for inspection and service.

.7 Pump casing to be grey cast iron, to ASTM A48, Class 35B, with smooth surfaces, devoid of blowholes and other irregularities. All exposed nuts and bolts to be 316L series stainless steel construction.

.8 Impeller ductile iron or grey cast iron, to ASTM A48, Class 35B, or duplex stainless steel A151 329, dynamically balanced, non-clog or recessed design having a long throughlet without acute turns.

.1 Impeller: capable of handling solids, fibrous material, heavy sludge, and other matter found in normal sewage applications.
.2 Impeller vane design and passing sphere as indicated.
.3 Pump out vanes in the back of impeller shroud to be large enough to sufficiently expel solids away from seal area.
.4 Maximum sized impellers for given pump model are not acceptable.

.9 Wear rings or wear plates:

.1 To provide efficient sealing between volute and impeller, and consist of a stationary hard metal wear system**,** which is fitted to volute inlet. Wear rings to be of softer construction than impellers and must be removable and designed to compensate for normal wear encountered for the application

.10 Pump shaft and sleeve:

.1 Accurately machined and of sufficient size to transmit full power from driver.
.2 Shaft material: to ASTM A108, Grade 1045 Steel.
.3 Protect shafts from wear by a chrome steel shaft sleeve to ASTM A743/A743M Gr. CA-15 325-400 BHN sealed to prevent leakage between sleeve and shaft.
.4 Provide each pump with a tandem mechanical shaft seal system.
.5 Tandem mechanical shaft seal to be of single spring design operating in an intermediate oil-filled seal cavity.
.6 The upper of the tandem set of seals operates in cooling medium. This set contains one (1) stationary ring and one (1) positively driven rotating ring.
.7 Seal materials: Tungsten - carbide or carbon ceramic.

.11 Bearings: arranged to eliminate radial play and with a minimum B-10 life of 40,000 hours in accordance with ABMA Std 9; grease lubricated with convenient tapped opening for routine lubrication. Bearings to be permanently greased, single roller type for the upper bearing and two (2) row angular contact type for the lower bearing.

.12 Electric motors:

.1 Pump motor: squirrel-cage induction, inverter duty rated type design, housed in a watertight or dielectric oil-filled chamber of maximum efficiency and durability. Provide a motor designed for continuous duty capable of sustaining a minimum of fifteen (15) starts per hour.
.2 Motor stator: directly shrink-fitted into the stator housing. Insulate stator winding and leads with moisture-resistant varnish capable of withstanding a

temperature of 155°C or the motors maximum temperature rise, whichever is greater. Insulation rating to Class F or higher.

.3 Rotor bars and short-circuit rings to be made of aluminium. Use thermal sensors to monitor stator temperatures on all pumps. Equip stator with not less than two (2) thermal switches embedded in the end coils of the stator windings (one (1) switch per phase to protect the motor against surcharges and high temperature). Use these in conjunction with, and supplemental to, external motor overload protection, and wired to the control panel.

.4 Equip air-filled motor housing with a moisture detector to detect any leakage of liquid into the stator housing. The signals from the thermal switches and the moisture detector to be wired to the control panel. Equip oil-filled motor housing with thermal switches only.

.5 Integrate moisture sensor detection system consisting of two (2) probes within the oil-filled seal chamber which is isolated from the motor chamber. This sensor will provide early warning of lower seal failure.

.6 Accomplish control of the moisture detector and the winding thermal switches by using a control/indicator relay(s) which will be installed and wired inside the control panel to stop the pump unit upon a fault signal.

.7 Motors to be air cooled or oil cooled to manufacturer's standard.

.8 Motor to be able to operate dry without damage while pumping under load.

.9 Appropriately match the motor to the speed and torque requirements of the proposed pump and confirm it is capable of continuous duty.

.10 Motors to comply with the latest edition of NEMA standard MG1, Motors and Generators, and CSA C22.2 No. 100, Motors, and Generators.

.11 The motors will be operated from a 600 volt, 3 phase, 60 Hz power supply. Voltage tolerance ± 10%.

.12 Motor to have a 1.15 service factor and shall be operable at the service factor load continuously without exceeding the insulation rated temperature rise at 40°C ambient.

.13 Pumps to be cooled with cooling fins; pumps over 10 kW are to be cooled with a water jacket around the stator casing. Provide a motor designed to operate up to 40°C ambient with a temperature rise not to exceed 80°C.

.14 Motors to be inverter duty rated.

.15 Motors and electrical assemblies must be suitable for use in a Zone 1 Hazardous Area as defined by the Canadian Electrical Code.

.13 Grinder pumps to have hardened stainless shredding ring and grinder to reduce sewage to a small size for discharge through small diameter piping.

.14 Power and/or control (monitoring) cable(s): neoprene-jacketed type SOW composite cable, inverter rated and sized to meet or exceed electrical code requirements. Cable to be continuous and suitable for submerged use and CSA certified.

.1 Combine power, temporary sensing and moisture sensor conductors into a single cord. Entry into the pump is accomplished in two (2) ways:

.1 On the smaller motors (up to 30 HP), furnish a plug-in power cable to allow easy changes of both voltage and cable length without motor entry.
.2 On the larger motors (30 HP and above) with much larger cable sizes, the cable enters through a double grommet and internal strain relief to a terminal strip for conductor attachment.

.2 Cable entry design must be capable of continuous submergence underwater without loss of watertight integrity to a depth of 20 m.

.15 Flush valves: install one (1), hydraulically operated flush valve in each wet well.

.16 Acceptable Manufacturers: Xylem/Flygt, KSB, or Sulzer.

2.3 Submersible Pump Hatch and Accessories

.1 Hatch, guide bars, pump discharge connection and lifting chains to be supplied by submersible pump manufacturer.

.2 Provide 316L stainless steel or hot-dipped galvanized vertical guide bar(s) or cables with each pump to ensure correct alignment of pump with automatic discharge connection and to allow pump lifting and lowering. Provide system to attach guide bars to access hatch using 316L stainless steel fasteners or brackets.

.3 For each pump, provide 316 stainless steel or hot-dipped, galvanized lifting chains, securely fixed at lower end to the pumps and at the upper end of the hook for attachment to a lifting winch.

.4 Pump Hatch:

.1 Frame material to be 6061-T6 aluminium. Fabricate cover using 6mm diamond plate of 5086 aluminium. Frame and cover designed for heavy-duty traffic loading of 16,000 lbs plus 30% impact H-20, wheel loads to AASHTO HB. Cover to rest on a rubber gasket to be hinged along one (1) side with a heavy-duty 316L stainless steel hinge.
.2 Top of the access frame to be flush, the handle recessed. Provide padlock clip within the recess to lock the cover in the closed position. Provide cover stay to allow the cover to be locked in the open position.
.3 Design access frames to be cast into the pre-cast concrete top of the wet well structure, extrusion to be shaped such as to provide good anchoring to the

concrete. All surfaces in contact with the concrete to be bitumastic coated. Frames to be capable of being installed side-by-side by bolting them together using standardized bolting kits.

.4 Provide aluminium rail nuts within the extrusions, permitting an upper guide holder, a level regulator hanger, and a chain hook to be attached without any modifications required to the frame.

.5 Clearly display a bilingual confined space warning label on the underside of the cover.

.6 Provide a safety grate for fall through protection. When installed in pairs, install safety grates so that they open outward.

.7 Acceptable Manufacturer: E.J. or Bilco.

.5 Provide cast iron, automatic discharge connection for each pump to connect pump to discharge piping. Discharge connection to be permanently fixed in position by anchor bolts attached to the bottom of the pump chamber and shall discharge connections to permit rapid and precise installation or removal of the pumps without entering the pump chamber.

2.4 Valve Chamber

.1 Valve chamber structure to be pre-cast concrete material, supplied and installed in accordance with Halifax Water – Section 33 39 00 – Manholes, Catch Basins and Structures.

.2 Dimensions and configuration: as indicated on the drawings.

.3 Provide minimum 500mm x 500mm x 575mm deep sump.

.4 Surface loading: designed for heavy-duty traffic loading of 16,000 lbs plus 30% impact H-20, wheel loads to AASHTO HB

.5 Roof Scuttle (Access):

.1 Mount roof scuttle on 150mm high, precast curb anchored into valve chamber structure.

.2 Size: 762 mm x 2,438 mm.

.3 Door leaf: single leaf aluminum (11 gauge).

.4 Channel frame: aluminum with anchor flange around perimeter water-tight gasket.

.5 Hardware: heavy-duty stainless-steel hinges, stainless steel pins, compression spring operators, and automatic hold-open arm with release handle.

.6 Provide 25 mm thick rigid insulation.

.7 Acceptable manufacturer: Bilco Type L or approved equal.

.6 Acceptable precast manufactured product: Utility Vault manufactured by Shaw Precast Solutions or approved equal.

2.5 Vents

.1 Vent pipe: 316L stainless steel material, welded, minimum schedule 10, not less than 150 mm diameter with smooth flow elbow fittings and flanges where indicated.

.2 Above-ground ventilation piping to be stainless steel and goose-necked with a bird screen on the open end.

.3 Ventilation ductwork, located within wet-wells and below-grade chambers or mechanical galleries, shall 316L stainless steel material.

2.6 Pipe and Fittings

.1 Stainless Steel:

.1 Pipe material: 316L stainless steel – schedule 10.
.2 All bolt assemblies to be 316L stainless steel material.
.3 Elbows to be smooth flow schedule 10 design.
.4 Weld neck or Vanstone Rings: 316L stainless steel conforming to ASTM A240 and pressed type with minimum 11 USS gauge.
.5 Backing flanges: 316L stainless steel to ASME B16.1, Class 125 bolt pattern.
.6 Grooved end couplings: galvanized rigid style Victaulic style No. 89 or W89 or approved equivalent.
.7 Gaskets: 3.2mm thick neoprene rubber suitably reinforced.
.8 Joints 50mm and less to be threaded.

.2 Ductile Iron:

.1 Ductile iron will be accepted as an alternate to stainless steel for exposed piping within chambers above floor slabs.
.2 Pipe material: ductile iron to AWWA C151, special Class 54, cement mortar lined to AWWA C104, maximum working pressure 2400 kPa.
.3 Pipe joints: flanged to AWWA C115 with Class 125 flange dimensions to ANSI/ASME B16.1.
.4 Fittings: ductile iron or grey iron to AWWA C110 with Class 125 flange connections to ANSI/ASME B16.1 and cement mortar lined to AWWA C104.
.5 Gaskets: 3.2mm neoprene rubber suitably reinforced.

.6 Coatings: all pipe and fittings to be coated with manufacturer's standard coating.
.7 Groove end couplings to be ductile iron to ASTM A536, Victaulic Style 31 (or equivalent), complete with flush seal "M" gasket.
.8 Bolt assemblies shall conform to ASTM A307 for Grade B steel machine bolts and nuts.

2.7 Isolation Valves

.1 Gate Valve:

.1 Service: Clean water for wash down of facility or incoming water service.
.2 Size up to 300 mm: ductile or cast iron body with Class 125 flanged ends to ASME B16.1 or to AWWA C509, minimum working pressure rating of 1,380 kPa, UL and FM approved. Mechanism shall be bronze mounted, solid wedge gates, OS & Y, rising stem handwheel type.
.3 Size 75 mm and smaller (stainless steel): 150 lbs Class, Stainless Steel, OS & Y gate valve with flanged ends.

.2 Plug Valve:

.1 Service: Wastewater, pump, and other equipment isolation.
.2 Rugged, eccentric type plug valves suitable for raw sewage service and minimum of 90% full port area.
.3 Rating: 1050 kPa at 37°C.
.4 Body: ASTM A126 Class B cast iron with nickel-welded raised seats, to AWWA C517, complete with ASME B16.1 Class 125 flanged end connection.
.5 Plug: Buna N or Neoprene coated for resilient plug face and bubble tight shut off.
.6 Bearings: stainless steel and Teflon permanently lubricated.
.7 Packing: Buna N or Teflon combination.
.8 Bolted bonnet design repackable without removing bonnet.
.9 Actuator: lever actuator for 150 mm and smaller valves; geared actuator with handwheel for valves greater than 150 mm; actuator to be supplied by valve manufacturer. Geared actuators to indicate valve position and have permanently lubricated bearings, cast or ductile iron housing and seals against dirt and water.
.10 Accessories: valves with centerlines greater than 2,135mm from the finished floor must be operated by chain operator and chain wheel provided by the valve manufacturer to operate that particular valve. Chain to be stainless steel and operator wheel to have full range of control for opening and closing valve. Use geared chain wheel operators on valves over 400mm. Chain

wheel to be fitted to operating nut of valve. Securing chain wheel to handwheel of valve is not acceptable.

.3 Ball Valves:

.1 Service: Wastewater and clean water general service for wash down and instrument location.
.2 Stainless steel, 3-piece body, 6900 kPa rated, full port ball valve with threaded end connections.

.4 Knife Gate Valves:

.1 Service: Wastewater, for wet-well compartment isolation and pump suction piping. May also be used for wet-well to dry-well isolation, but only when there is insufficient space for plug valve.
.2 Heavy duty cast stainless steel body to AWWA C520 with PTFE seats and braided PTFE packing with EDPM O-ring seal. Connections to be 125 lb. flanged to ASME B16.1 complete with lugs. Liner and gate material to be 316L stainless steel.
.3 Floor box: provide 316L stainless steel stem extension. Floor boxes to be fabricated from 316L stainless steel and sealed from top and bottom. Provide 50mm operating nut and guide assembly. Confirm position of floor box is suitable for "T" operation key.
.4 Stem extensions: Designed to manually operate, fabricated from stainless steel, and be directly mounted to the valve actuator.

2.8 Check Valves

.1 Check Valves (less than 50mm):

.1 Service: sanitary sewage.
.2 Swing type check valve with threaded end connections. Cast stainless steel with 316 stainless steel components suitable for 1060 kPa cold water service.

.2 Check Valves: (50mm and larger):

.1 Ball Check Valves:

.1 Service: sanitary sewage.
.2 Install in vertical orientation only.
.3 Only use ball check valves for pipe work of 100 mm diameter or less.
.4 316L stainless steel body non-clog, unobstructed free flow type

suitable for raw sewage service and with threaded NPT end connections.

.5 Ductile iron or cast iron body, non-clog, unobstructed free flow type with two (2) bolt bonnet and with flanged end connections, 316L stainless steel hardware.

.2 Swing Check Valves:

.1 Service: sanitary sewage.
.2 Full body, swing type check valve with lever and weight closure to AWWA C508. Body and disk to be cast iron or ductile iron, bolted bonnet in accordance with ASTM A-126-B, with stainless steel hinge shaft, bronze seats. Valve interior to be fusion bonded epoxy.
.3 Valve to be rated for 1735 kPa working pressure.
.4 ANSI B 16.1 Class 125 flanged connections. 316L stainless steel hardware.
.5 Flexible flapper type swing check valves are an acceptable alternative. Body to be ductile iron with bolted bonnet. Non-clog, flexible, nylon reinforced or NBR over a steel disc. Valve interior to be fusion bonded epoxy.

2.9 Miscellaneous Items

.1 Splash plate: fabricated from 316L stainless steel.

.2 Insulation: as specified in Halifax Water – Section 33 39 00.

.3 Waterproofing: as specified in Halifax Water – Section 33 39 00.

.4 Roof Scuttle Locking Mechanism: fabricated from hot-dipped, galvanized metal.

.5 Ship ladder and handrail: fabricated from hot-dipped, galvanized metal. FRP is an acceptable alternative material. FRP grating, members, anchorage and supports to be designed by the manufacturer using a live load of 4.80 kPa and limiting deflection to the maximum of L/360 or 6 mm.

.6 Wet well structure: precast as specified in Halifax Water – Section 33 39 00. Cover section designed for heavy-duty traffic loading of 16,000 lbs plus 30% impact H-20 wheel loads to AASHTO HB.

.7 Provide sleeves for personnel lifting davits / recovery sets for access into wet wells. Cast-in stainless steel, core (floor) sleeves, below concrete surfaces for

portable davit arm. Sleeves to be compatible for "Miller (Honeywell)" portable davit arms.

2.10 Pipe and Equipment Support

.1 Pipe Supports:

.1 316L stainless steel construction with stainless steel hardware in wet wells.
.2 316L stainless steel or hot-dipped, galvanized steel with stainless steel hardware in valve chambers.

.2 Fabricate hangers and supports in accordance with ASME B31.3 and MSS-SP58.

.3 Support only from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members. Provide supplementary members suitable for use of the products specified in this section.

.4 Pipe Hangers:

.1 Pipe hangers and supports to be 316L stainless steel.
.2 Inserts and fasteners to be stainless steel.

.5 Concrete Pads:

.1 Provide minimum 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 65 mm beyond equipment flanges; chamfer pad edges.
.2 Provide concrete pipe supports where indicated. Extend concrete to spring line of pipe; pipe supports to be 65 mm wider than pipe on both sides; chamfer edges.

.6 Elevate floor mounted support plates on a minimum of 25mm thick, chamfered, grout pad.

2.11 Pressure Gauges

.1 Stainless steel case type. Minimum pressure gauge increments 14 kPa (2 psi); a minimum of 100 mm faced diameter, glycerin filled, graduated in psi and kPa and have an accuracy of 3% at maximum reading. Select the range of pressure measuring instruments so that full scale reading will equal 200% of typical operating pressure, or 120% of system design pressure, whichever is greater.

.2 Acceptable product:

.1 Ashcroft Duralife 35-1009.
.2 Ametek.
.3 Marsh.
.4 Winters.

2.12 Sump Pump

.1 Application: sump pumps located in drywells or valve chambers and used to pump floor drainage.

.2 Sump pump to be of heavy duty, cast iron construction, with a threaded discharge connection and have a rated duty of 267 L/min @ 7.6m T.D.H.

.3 Equip sump pump with an integral float switch and internal controls to operate pump. Motor to be 0.37 kW (1/2 Hp). Sump pump motor, controls and assembly must be suitable for use in a Zone 2 hazardous area.

.4 Supply sump pump with manufacturer's standard power cord which will be field modified with a CSA certified plug suitable for a Zone 2 hazardous area.

.5 Acceptable Manufacturer: Zoeller Model MX161 or approved equal.

2.13 Continuous Liquid Level Measurement

.1 Provide device for continuous liquid level measurement to control the operation of the pumps and provide alarms in accordance with all possible variations of sewage levels in the pump station wet well.

.2 Laser type level meter meeting the following requirements:

.1 Range: 0-7.5m (excluding deadband).
.2 An isolated 4-20 mA output signal, loop powered.
.3 Minimum accuracy of +/- 11mm.
.4 Capable of local calibration/setup, with self diagnostics.
.5 Local display of level with engineering units. Local display of level or flow to suit application with engineering units.
.6 As least two (2) programmable relay outputs. SPDT contacts rated for a minimum of 5A at 120 VAC (continuous use).
.7 Automatic level to volume conversion for standard or custom tank shapes.
.8 Provide integral temperature compensation.
.9 Sensor rated for applicable Zone 1 hazardous area classification.
.10 Acceptable manufacturer: ABB LLT100 or approved equal.

2.14 Flow Meter

.1 Electromagnetic type flow meter suitable for sanitary sewage.

.2 Flow tube liner to be hard rubber and of the “formed” type, complete with stainless steel backing ring. Minimum 316 SS, self-cleaning electrodes. Supply grounding hardware in accordance to manufacturer's recommendations.

.3 Flow tubes located in areas that could be submerged must be rated accordingly.

.4 Mount flow transmitter remotely from the flow tubes in control panel or in above grade structure. Integrally mounted flow transmitters will be permitted if meter is readily accessible to the operator, and it is not located in a hazardous area. Flow transmitters to have a minimum enclosure rating of NEMA 4X.

.5 Able to program flow transmitter locally using keypad via simple menu-driven software, with integral display showing flow rate with engineering units, and totalized flow. Online diagnostics of flow sensor and converter, including process checks and linearity and calibration checks and pulse output signal for flow totalization. Operator alarm notification via transmitter display, relay outputs, and output signal (4-20 mA upscale/downscale manipulation).

.6 4-20 mA output of flow rate, HART compatible, loop powered, isolated. Minimum system flow accuracy of +/- 0.5% of reading with adjustable damping ability and adjustable low flow cut-off.

.7 Assembly must be suitable for mounting meter in a Zone 2 area as defined by the Canadian Electrical Code.

.8 Acceptable Manufacturers: ABB Model ACQ, Khrone or Endress-Hausser.

2.15 Float Switches

.1 Top mounted, suspendable float type switch, complete with integral cable with length as determined on-site.

.2 Suitable for immersion in sanitary sewage.

.3 One (1) SPDT contact, rated for continuous duty, minimum 5 amps at 120 VA.

.4 Provide intrinsically safe barrier, where float switch is installed in hazardous area.

.5 Acceptable Manufacturer: ITT Flygt ENM-10EX, Magnetrol or approved equal.

2.16 Air / Vacuum Relief Valves

.1 Service: sanitary sewage:

.1 Air-Vacuum valve for relief of vacuum and release of air.
.2 Air-release valve for release of air only.

.2 Valve sizes 75mm and smaller to have full size NPT inlets and outlets equal to the nominal valve size. To AWWA C512. Body inlet connection to be hexagonal for a wrench connection. Valve sizes 100 mm and larger to have bolted flange inlets with threaded or plain outlets and protective hoods to prevent debris from entering the valve. Flanges to be in accordance with ASME B16.1 for Class 125.

.3 Valve to have two (2) additional NPT connections for gauges, testing, and draining.

.4 Valve body to provide a through flow area equal to the nominal valve size. Provide a bolted cover with alloy screws and flat gasket to allow for maintenance and repair.

.5 Provide a guarantee for floats against failure including pressure surges. Float to have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. Protect float against direct water impact by an internal baffle.

.6 Resilient seat to provide drop tight shut off to the full valve pressure rating. Seat to be a minimum of 12 mm.

.7 On valve sizes 100 mm and larger, fit the cover to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times.

.8 Valve body, cover, and baffle to be constructed of ASTM A126 Class B cast iron or ductile iron. Float, guide shafts, and bushings to be constructed of Type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats to be Buna-N.

2.17 Modular Water-Stop Seals

.1 Application: for pipes passing through or into chambers or structures at a location or elevation which may be below finished grade.

.2 Have sleeves furnished by the manufacturer of the material supplied for the annular space. Coordinate sleeve sizes with the carrier pipe size and material for

complete compatibility. Cast-in sleeves to be galvanized steel with an intermediate flange collar with a continuous double fillet weld.

.3 Seal the annular space watertight with mechanically expanded interlocking synthetic rubber links. Nuts and bolts shall be zinc coated steel.

.4 Acceptable manufacturer: Link-Seal, Pen-Seal Proco, or equal.

2.18 Flexible Couplings

.1 Application: buried piping.

.1 Mechanical joint (solid) sleeve type coupling to AWWA C110 / A21.10.

.2 Application: buried piping, joining pipes with different outside diameters.

.1 Ductile iron, coupling complete with high strength low alloy steel nuts to ASTM F3125/F3125M, type 3, ASTM A56 ductile iron follower, fusion bonded epoxy finish and EDPM or Buna N gaskets.

.2 Acceptable Manufacturer: Smith-Blair Model 411, Robar, Romac or approved equal.

PART 3 EXECUTION

3.1 Delivery, Handling and Storage

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperature and conditions required by manufacturer at no additional cost to the Contract.

.5 Handle and store pumps, pipes, valves, instruments, and fittings, in such manner as to avoid shock and damage. Do not use chains or cables passing through pipe bore. Do not damage coatings or linings.

.6 Store gaskets in cool location, out of direct sunlight, and away from petroleum products.

.7 Store valves and pipe work to prevent retention of water and damage by freezing.

3.2 Piping

.1 Install piping in the locations indicated, and to the elevations and lines as shown on the Drawings.

.2 Coordinate location and furnish embedded items for installation in pre-cast or poured-in-place concrete.

.3 Cut pipes where necessary to obtain the exact location of fittings or valves.

.4 Provide clearance around systems, equipment, and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer. Provide space for disassembly, removal of equipment and components.

.5 Screwed pipes to be NPT. Make joints with graphite and oil filler and adequate unions provided for ease of future uncoupling. Ream cut ends of pipe to remove burrs.

.6 Install specialties and other like items in accordance with the manufacturer's instructions. Provide small piping, or tubing, with fittings where required for their proper operation and servicing.

.7 Install drain valve at low points in piping systems, at equipment and at section isolation valves. Drain valves: NPS 25mm stainless steel ball valves unless indicated otherwise, with hose end male thread, cap, and chain.

.8 Install air vents at high points in piping systems. Manual air vents to be NPS 25mm stainless steel ball valves unless indicated otherwise.

3.3 Pipe Support

.1 Provide permanent support as indicated on the drawings.

.2 Restrain pipe and fittings so that all thrusts are supported independently of the piping system.

.3 Coordinate work to install pipe supports after benching of chambers is complete.

.4 Coordinate support work. Confirm permanent supports are complete before removing any temporary support.

3.4 Painting

.1 Paint ductile iron pipe and fittings. Do not paint stainless steel piping, fittings and supports.

.2 Paint valves and miscellaneous devices to match adjacent piping. Do not paint over nameplates.

.3 For ductile iron piping coated with manufacturer's asphalt sealer, provide one (1) coat BIN pigmented white shellac sealer and two (2) coats semi-gloss enamel CAN/CGSB-1.59. Colour to be Grey (matching PPG 506-4).

3.5 Valves

.1 Install valves in the correct orientation with respect to flow direction and in accordance with manufacturer's recommendations.

3.6 Pumps and Appurtenances

.1 Locate, align, level, adjust and install pump discharge base elbows. Locate pumps and discharge base elbows so that the pumps can be easily removed through the openings in the lift station without requiring the removal of any station equipment. Confirm sufficient clearance is present to permit easy pump removal when a flush valve is installed on the designated pump.

.2 Install upper guide bar or cable holders and guide bar(s) or cables in accordance with the pump and anchor manufacturer's instructions, so that the guide bars are true, plumb and in the proper location and alignment so that the pumps can be easily removed through the openings in the lift station cover.

.3 Protect the finish on the pumps, pipe, fittings, valves and appurtenances from scratches and other damage. Repair any damage to the surface finishes.

3.7 Pressure and Leakage Testing

.1 Perform pressure and leakage testing of all piping, valves and wet wells.

.2 Provide, in writing to Halifax Water, the plan for pressure testing. Plan to indicate the areas to be tested.

.3 Have all pressure testing witnessed by Halifax Water and the applicant's professional engineer, or their representative. Provide Halifax Water 24 hours' notice to schedule the work.

.4 Provide labour, equipment and materials required to perform pressure and leakage testing.

.5 Pressure test piping at a minimum pressure of 1400 kPa or 1.5 times the operating pressure at the lowest point of piping being tested. Maintain test pressure without leakage for 15 minutes. If leakage or loss of pressure occurs, make repairs and re-test until successful testing is achieved. Conduct testing procedures in accordance with the National Plumbing Code.

.6 Test wet-wells and water retention tanks for leakage. Fill the tanks to the top cover level (or the highest level that is practical) with water. Following a 24-hour period, re-fill the tanks and then monitor for 4 hours. Measured leakage after the 4-hour period must be less than 5 litres/hour/0.8 m^2 surface area/1000 mm of vertical height. If leakage is greater than allowable, make repairs and re-test, until successful testing is achieved. Regardless of test results, repair any visible leaks, seepage, or weeping.

3.8 Equipment Manufacturers's Inspection and Testing

.1 Provide the services of competent servicemen, mechanics or other trained personnel of the equipment supplier's or manufacturers to check the complete installation and be present for start-up of the equipment. Submit a written report signed by the equipment manufacturer's representative to the Engineer stating the following:

.1 That a satisfactory installation of equipment has been performed and outlining any modifications that have been made as a result of the commissioning or testing of the equipment at no additional cost to the Contract.
.2 That the equipment is now ready for permanent operation.
.3 Test installed equipment with actual plant operation to verify hydraulic balancing, head loss and effluent quality. Make adjustments required to place equipment into operation and to optimize the treated water quality.

.2 Have the equipment manufacturer's representative fully instruct the permanent operator of the equipment in the proper operation and maintenance of all equipment at no additional cost to the Contract.

.3 Advise in writing at least one (1) week in advance of the proposed date for testing and start-up. Conduct tests in the presence of the Engineer.

.4 Replace defective material or equipment with new material or equipment. Bear costs including re-testing and repairing.

.5 Assume a minimum period of two (2) days on site for skilled supervision and instruction and a minimum of two (2) trips to the site by the equipment manufacturer. Provide as many trips and days on site to complete the installation and put the equipment into satisfactory operation.

3.9 Cleaning

.1 Clean interior and exterior of all systems including strainers, supports, vents, sumps, piping systems, tanks, pumps, etc.

.2 Upon completion of testing, remove all test equipment and cap holes to satisfaction of the Engineer.

.3 In preparation for final acceptance, clean and refurbish all equipment, fixtures and trim and leave in operating condition and piping systems in preparation for final acceptance.

.4 Leave all areas cleaned of debris and unused materials.

3.10 Commissioning

.1 Prior to starting the pumps, remove the plug or cap from the forcemain in the manhole.

.2 After pumps, valves, and piping have been tested, fill pumps with the material they are to pump, or with water, operate and pump for a duration of time sufficient to satisfy that the complete installation has been properly installed. Confirm pumps and piping are free of debris or obstructions.

.3 Demonstrate each pump can be easily removed from the lift station without obstruction or removal of any station equipment. Make any adjustments necessary to carry out pump removal in this manner.

.4 Demonstrate the operation of all valves and make any adjustments necessary to permit the valves to be operated smoothly without obstruction and allow the pumps to be removed with the valves in an open or closed position.

.5 Demonstrate integrity of pump discharge connection seal to pump by pumping down wet well sufficiently to detect leakage.

.6 Observe wet well and valve chamber piping during pump operation for leaks and/or loose connections. Repair any leaks identified.

.7 Test pump flow in accordance with specified pump curves stated for pump characteristics.

END OF SECTION