GO TRANSIT

EFFLUENT EJECTION SYSTEMS

DESIGN GUIDELINES AND SPECIFICATIONS

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15010 Mechanical General Conditions

15415 Sump Pumps

15702 Discharge and Vent Piping and Fittings

15715 Sump Accessories

15900 Pumps Controller

05510 Pit Access Ladder

07720 Pit Safety Railings

END OF SECTION
PART 1  GENERAL

1.1 DUTIES OF MECHANICAL CONTRACTOR

1.1.1 The mechanical contractor shall assume the responsibilities and duties including but not limited to the ones described below:

1.1.2 Superintendence

1.1.2.1 Provide full time on-site superintendent personnel and supporting staff with proven experience in project of similar value and complexity.

1.1.2.2 Site superintendent shall have over-all authority to speak for and represent the mechanical contractor.

1.1.3 Coordination

1.1.3.1 Coordinate the work with all the sub-trades involved to ensure that the work will be carried out on schedule and in proper sequence.

1.1.3.2 In particular, coordinate the elements of the effluent ejection systems that require embedding in concrete (access doors, frames, support plates, anchors, etc). Ensure that all embedded elements are in the correct position.

1.1.3.3 Take complete responsibility for all remedial work that results from failure to coordinate any aspect of the mechanical work prior to its fabrication and/or installation.

1.1.3.4 Take responsibility for the delivery of equipment necessary to complete the work in accordance with the approved schedule.

1.1.4 Staffing and Scheduling

1.1.4.1 Within seven days after the award of the contract, the Mechanical Contractor shall provide to the Owner representative the following information:

- Appointment of official representatives in the project.
- Schedule of work.
- Delivery schedule for specified equipment.
- Requirements for temporary facilities, site signs, storage, etc.
1.1.5 Work Completion Meeting

1.1.5.1 Prior to application for Substantial Performance of the Work, the mechanical contractor shall participate in the take-over meeting. Agenda to include the following:

- Review of outstanding deficiencies.
- Submission of maintenance manuals, warranties and as-built drawings.
- Results of performance tests and described further in this section.
- Scheduling of training to Owner’s personnel.

1.2 INTENT

1.2.1 Bidders for this work shall include for all labor, material, equipment and all other related cost including all applicable taxes (except GST) and fees to provide a complete effluent ejection system consisting of the following components:

1.2.1.1 Sump pumps, suitable for the type of fluid to be ejected.
1.2.1.2 Discharge piping, fittings and accessories.
1.2.1.3 Vent piping, where applicable
1.2.1.4 Sump pumps accessories (guide rails, break-away fittings, access doors, etc. as specified herein).
1.2.1.5 Access hatches
1.2.1.6 Lifting devices
1.2.1.7 Level monitoring and digital controllers, including audio-visual alarms.
1.2.1.8 All power cabling and controls wiring required to make the system fully operational.

1.2.2 Misinterpretation of any requirement of the drawings and specifications will not relieve the Mechanical Contractor of responsibility. If in any doubt, the Mechanical Contractor shall contact the Consultant for written clarification prior to submitting a bid for the Work.

1.3 CONTRACT

1.3.1 Wherever differences occur between plans and riser diagrams or schematics and drawings, the maximum conditions shall govern and the bid shall be based on whichever indicates the greater cost.

1.3.2 Field verifications of dimensions on plans shall be made since actual locations, distances, and levels will be governed by actual field conditions.

1.3.3 Discrepancies between different plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Consultant for a decision.
1.3.4 Install all mechanical services including but not exclusive to drains and pipes to conserve headroom and interfere as little as possible with the free use of the space through which they pass. All drains, pipes, ducts, etc., particularly those which may conflict with other trades, shall be installed only after the locations have been approved by the Consultant.

1.3.5 Before commencing work, check and verify all grade and invert elevations, levels, and dimensions, to ensure proper and correct installation of the work.

1.3.6 In addition to the work specifically mentioned in the Specifications and shown on the drawings, provide all other items that are obviously necessary to make a complete working installation, including those required by the Authorities Having Jurisdiction over the work.

1.4 SUBCONTRACTOR'S SHOP

1.4.1 Provide Job site office, work-shop, tools, scaffolds, material storage, etc., as required to complete the work of Mechanical Contractor.

1.5 CODES, PERMITS, FEES AND CONNECTIONS

1.5.1 Conform to Federal, Provincial and Municipal regulations and perform work in accordance with requirements of By-Laws and Regulations in force in area where the work will take place.

1.5.2 Apply for, obtain, and pay for permits, fees and service connections for the mechanical work and the inspections required by Authorities Having Jurisdiction in the area where the work will take place.

1.6 MATERIALS

1.6.1 Where materials, equipment, apparatus, or other products are specified by the manufacturer, brand name, type or catalogue number, such designation is to establish standards of desired quality style or dimensions and shall be the basis of the Bid. Materials so specified shall be furnished under this Contract, unless changed by mutual agreement.

1.7 MATERIAL SUBSTITUTIONS

1.7.1 After execution of the Contract, requests for substitution of materials of makes other than those specifically named in the Contract Documents may be approved by the Consultant.

1.8 SHOP DRAWINGS AND SAMPLES

1.8.1 Submit to the Consultant detailed dimension shop drawings and installation wiring diagrams for all mechanical equipment. Further details and special
requirements called for in these specifications shall be shown on the shop drawings.

1.8.2 Ensure that copies of all reviewed shop drawings are available on the job site for reference.

1.8.3 Provide samples of mechanical equipment as requested in the specification at the same time as the shop drawing submission.

1.9 AS-BUILT DRAWINGS

1.9.1 Maintain up to date "as built" drawings on site and submit to Consultant at completion of the project as specified in this section.

1.9.2 Any subsequent changes found by the Consultant shall remain the responsibility of the Contractor at no charge to the City.

1.10 CONSULTANT’S INSTRUCTIONS

1.10.1 During construction the Consultant will issue such instructions as may be necessary for verification and correction of the work. These instructions shall be binding as part of the specification.

1.11 ADDITIONAL WORK AND CHANGES

1.11.1 Unless a written order reviewed by the Consultant and countersigned or otherwise approved by the Owner Representative, no additional work shall be undertaken by the Contractor.

1.12 WARRANTY

1.12.1 The complete system shall be covered by a 2-year warranty against failure due to defects in materials or workmanship.

1.12.2 All warranty periods are measured from the date the substantial completion of the system has been confirmed by the consultant.

1.13 SCHEDULING OF WORK

1.13.1 For all work to be performed under this contract, adhere to Construction Schedule agreed upon with the General Contractor and the Owner.

1.14 EQUIPMENT REQUIREMENTS AND INSTALLATION

1.14.1 Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping systems and without interference from building structure or other equipment.
1.14.2 Provide accessible means for lubricating equipment including permanent lubricated bearings.

1.15 PIPE HANGERS AND SUPPORTS

1.15.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1-1980.

1.15.2 Anchoring of piping and equipment shall be to manufacturers recommendations. Submit anchorage system, arrangement and type of hangers supports with calculations for review.

1.15.3 For pipes up to 4" diam, approved type expansion shields and bolts may be used. All drilling for hangers, rod inserts and work of similar nature shall be completed by Mechanical Contractor.

1.15.4 Adjustable clevis type hanger: on all sizes of pipes. Use roller type hangers as required. Standard of Acceptance: Myatt, Grinnell.

1.15.5 Adjust full clevis type hanger to MSS-SP58-1979, type 1, ULC listed.

1.15.6 For all non-copper pipes, typical Grinnell figure 260. For all copper pipes, use copper plated, Grinnell figure CT-65.

1.15.7 Space support within 12" of each horizontal elbow. Provide hanger within 18" on each side of valve or tee.

1.15.8 Hangers shall be 3 piece minimum standard i.e. attachment, rod, pipe attachment. Mild steel wall hooks may be used to support non-expanding piping. Allow 1" minimum clearance for insulated pipe.

1.15.9 On un-insulated copper piping, use Teflon coated hangers. Provide saddles for all insulated pipes and prefabricated insulation shields with high density insulation with vapour barriers for domestic cold water and chilled water piping. Standard of Acceptance: Grinnell Saddles 160 or 165, Grinnell Shields 167, Myatt: Apex.

1.16 TESTS

1.16.1 Do not insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests. Conduct tests in presence of Consultant. Bear costs including retesting and making good.

1.16.2 Pipe pressure: Hydraulically test piping systems at 1.5 times system operating pressure or minimum 860 kPa, whichever is greater. Maintain test pressures without loss for 4h unless otherwise specified.
1.16.3 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures.

1.17  PAINTING

1.17.1 Apply at least one coat of corrosion resistant primer paint to all exposed discharge piping, supports, and equipment fabricated from ferrous metals.

1.17.2 Touch-up paint all damaged equipment with products matching original finish in quality and appearance.

1.18  SPECIAL TOOLS AND SPARE PARTS

1.18.1 Furnish spare parts as follows:

   1.18.1.1 One set of packing for each pump.
   1.18.1.2 One glass for each gauge glass installed.
   1.18.1.3 One set of v-belts/bolts for each piece of machinery.

1.19  DIELECTRIC COUPLINGS

1.19.1 Provide wherever pipes of dissimilar metals are joined.

1.20  INSTRUCTION OF OPERATING STAFF

1.20.1 Supply certified personnel to instruct Go Transit operating staff on operation of new mechanical equipment. Supply maintenance specialist personnel to instruct operating staff on maintenance and adjustment of mechanical equipment and any changes or modification in equipment made under terms of warranty.

1.20.2 For instruction methodology and time period, refer to section 15900.

1.20.3 Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn manuals over to the Consultant.

1.20.4 Scheduling of the timing for the training of the operating staff shall be arranged 10 days prior to the completion of the project.

1.21  MAINTENANCE MANUALS

1.21.1 Provide minimum of six (6) copies of Mechanical Maintenance Manuals. Mechanical Maintenance Manuals to be delivered to the Consultant's office 10 days prior to the substantial completion of the Contract.

1.21.2 Manuals to be bound in a hard cover neatly labeled: "OPERATING AND MAINTENANCE INSTRUCTIONS".
1.21.3 The Maintenance Manuals shall be divided into sections with neatly labeled and tabbed dividers between each section. The sections to be included in the manual are:

1.21.3.1 Section I - General.
1.21.3.2 Section II – Metallic Piping, Pump Systems and Pit Accessories.
1.21.3.3 Section III - Automatic Controls.

1.21.4 The following information shall be contained within the sections:

1.21.4.1 SECTION I: A list giving name, address and telephone number of the Consultant, Engineers, and General Contractor, Mechanical Trade and Controls Trade. Warranty certificates for the Mechanical Systems. A copy of the Valve directory giving number, valve location, normal valve position, and purpose of valve (a framed copy of Valve Directory to be hung in the boiler room). Equipment lists and certificates shall be provided - certificates shall be signed and sealed by the appropriate suppliers.

1.21.4.2 SECTION II: A copy of all pressure tests and operational tests. A list giving name, address and telephone number of all suppliers. A copy of all reviewed Shop Drawings for the mechanical equipment. Copies of all operations and maintenance manuals supplied by the equipment manufacturer.

1.21.4.3 SECTION III: Complete Control Diagrams, Wiring Diagrams and description of Control system and the functioning sequence of the system. For details, refer to section 15900

1.22 CONCRETE

1.22.1 All concrete work required to complete this project, whether shown on the drawings or not, shall be the Contractor's responsibility.

1.23 METALS

1.23.1 All steel construction required for the completion of this project, whether shown on the drawings or not, shall be the Contractor’s responsibility.

1.24 CUTTING, PATCHING, ROOFING AND X-RAY

1.24.1 All cutting, patching, roofing and X-Rays required for the completion of this project whether shown on the drawings or not, shall be the Contractor's responsibility. The cutting and patching work shall be performed in accordance with the following:
1.25 PERFORMANCE TESTS AND EQUIPMENT START-UP

1.25.1 All major equipment including but not limited to boilers, coils and pumps, are to be inspected by the manufacturer to ensure that the equipment has been installed in accordance with their recommendations.

1.25.2 After all equipment has been installed, inspected by the manufacturer, adjusted, balanced and started up, subject equipment to a series of performance tests, as soon as conditions permit.

1.25.3 The timing of the tests shall be arranged to suit the convenience of the Consultant, and the manner and duration shall be as the Consultant deems necessary. Record the daily start and stop times, operating hours and functions performed. Ensure that the performance tests are witnessed by the Consultant.

1.25.4 Operate equipment under varying load conditions, demonstrate start-up sequence, normal shutdown, simulated emergency shutdown, operation of temperature, etc., and safety controls. Operate switches and electrical devices for correct wiring sequences. Adjust components to achieve a proper functional relationship among all the components of all the systems. Repeat these functions as many times as deemed necessary by the Consultant to achieve reliable operation.

1.25.5 Repair defects and repeat tests as necessary. During test maintain lubrication schedule.

1.25.6 At the successful completion of Performance Tests and all testing and balancing, make the systems ready for final inspection and subsequent acceptance of Go Transit. Replace and clean filters, flush out lines and equipment, remove and clean strainers, fill liquid systems and purge air.

END OF SECTION
PART 1  GENERAL

1.1  DESCRIPTION

1.1.1  Sanitary sewerage pump.

1.2  SUBMITTALS

1.2.1  Submit in accordance with Section 15010, shop drawings, manufacturer's literature and data for the following:

1.2.2  Pump:

   1.2.2.1  Manufacturer and model.
   1.2.2.2  Operating speed.
   1.2.2.3  Capacity.
   1.2.2.4  Characteristic performance curves.

1.2.3  Motor:

   1.2.3.1  Manufacturer,
   1.2.3.2  Speed.
   1.2.3.3  Current Characteristics and W (HP).
   1.2.3.4  Efficiency.

1.2.4  Control Panel, Monitoring and Sensors

   1.2.4.1  Electrical wiring
   1.2.4.2  Inputs and outputs
   1.2.4.3  Sequencing and function
   1.2.4.4  Level sensing equipment

1.2.5  Sump Accessories

   1.2.5.1  Sump access doors
   1.2.5.2  Vents
   1.2.5.3  Guide rails
   1.2.5.4  Lifting mechanisms
   1.2.5.5  Level controls
   1.2.5.6  Controllers
   1.2.5.7  Cable protection systems
   1.2.5.8  Break-away fittings

1.2.6  Certified copies of all the factory and construction site test data sheets and reports.
1.2.7 Complete operating and maintenance manuals including wiring diagrams, technical data sheets and information for ordering replaceable parts.

1.2.8 Include complete connection which indicates all components of the system.

1.2.9 Include complete diagrams of the internal wiring for each item of equipment.

1.2.10 Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

1.3 CAPACITY AND PERFORMANCE

1.3.1 As indicated on the equipment schedules

1.4 STANDARD OF ACCEPTANCE

1.4.1 ITT Flygt, ABS Pumps

PART 2 PRODUCTS

2.1 GENERAL

2.1.1 Removal/Disconnect System:

2.1.1.1 In a system utilizing a submersible pump, where sump depth, pump size, or other conditions make removal of the pump unusually difficult or unsafe, a removal/disconnect system shall be provided. The system will consist of a discharge fitting mounted on vertical guide rails attached to the sump. The pump shall be fitted with an adapter fitting that easily connects to/disconnects from the discharge fitting as the pump is raised from or lowered into the sump. The discharge piping will connect to the discharge fitting so that it is not necessary to disconnect any piping in order to remove the pump.

2.1.1.2 Where the sump depth is greater than five feet or other conditions exist to make the removal of the pump difficult or hazardous, the system shall include a rail guided quick disconnect apparatus to allow the pump to be pulled up out of the sump without workers entering the sump and without disconnecting the piping.

2.1.2 Minimum Run-Time

2.1.2.1 Sensors that detect the level of water in the sump shall be so arranged as to allow the accumulation of enough volume of liquid below the normal on level that the pump will run for a minimum cycle of one minute. Sensors shall be located to activate the alarm adequately before the water level rises to the inlet pipe.
2.1.3 Power Supplies

2.1.3.1 Provide two separate power supplies to the control panel, one for the control/alarm circuitry and one for power to the pump motors. Each power supply is to be fed from its own breaker so that if a pump overload trips a breaker, the alarm system will still function. Each power supply is to be wired in its own conduit. Wiring from the sump to the control panel shall have separate conduits for the pump power and for the sensor switches. All conduits are to be sealed at the basin and at the control panel to prevent the intrusion of moisture and of flammable and/or corrosive gases.

2.1.4 Fittings

2.1.4.1 Provide a check valve and gate valve in the discharge from each pump

2.2 DESIGN CRITERIA

2.2.1 Select the pump type based on the expected properties of the fluid to be ejected from the pit (clean, containing solids and abrasive material, containing fibrous material, etc).

2.2.2 By default, there will be two pumps in each effluent ejection system, unless otherwise instructed by GO Transit.

2.2.3 The total ejection capacity of the system shall be 130% of the maximum anticipated discharge into the pit.

2.2.4 Each pump shall be selected for 65% of the maximum anticipated discharge into the pit. The pump pressure shall be calculated to overcome the hydraulic resistance of the piping (including fittings such as elbows, valves, check valves, etc) plus the hydrostatic height between the lowest level of the fluid in the pit and the highest point of the discharge pipe.

2.2.5 The minimum level of the fluid in the pit shall not drop below the level recommended by the manufacturer to maintain the system primed.

2.2.6 The maximum level of the fluid allowed in the pit (alarm level) shall not exceed the invert of the lowest pipe discharging into the pit.

2.2.7 The distance between the “Lead Pump ON” and “Pumps OFF” levels shall be such that the volume of water will keep the lead pump running for min. 1 minute.

2.2.8 The distance between “Lead Pump ON” and “Both Pumps ON” shall be sufficiently large to avoid level sensors interference due to fluid turbulence during pumping.
2.2.9 Same interference avoidance principle to apply between “Both Pumps ON” and “Alarm” levels.

2.2.10 Vent all sanitary pits to the ambient in accordance with the code. Min. vent size to be 3” (75 mm.).

2.2.11 All sanitary pit covers to be gasketted around the perimeter.

2.3 GRINDER-TYPE PUMPS

2.3.1 Application

2.3.1.1 Pumped medium: sewage and other heavily polluted wastewater that includes rags, long fibers and solids.

2.3.1.2 Each grinder pump shall be a heavy duty pump modified to be used as a grinder. Each grinder pump shall contain special cutters to reduce sewage to a fine slurry.

2.3.1.3 The stationary and rotary cutters shall consist of hardened 316 “L” stainless steel. The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of seal materials and wet end (volute, impeller, rotary and stationary cutter), shall be similar to the heavy duty pumps used in larger pump stations for daily operation.

2.3.2 Pump Design

2.3.2.1 Grinder pump(s) shall be available in the following configuration:


2.3.2.2 The MP Grinder pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well.

2.3.3 Approvals

2.3.3.1 The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. An approval of the motor unit only will not be acceptable.

2.3.3.2 The pump/motor unit is also approved by CSA for service in Class I, Division 2, Groups A, B, C or D hazardous locations.
2.3.4 Pump Construction

2.3.4.1 Major pump components shall be of grey cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel, shall be protected by a factory applied spray coating of alkyd primer with a synthetic resin enamel finish on the exterior of the pump.

2.3.4.2 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

2.3.4.3 Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.3.5 Motor

2.3.5.1 The pump motor shall be a NEMA-B design induction type with a squirrel cage rotor, shell type design and be housed in an air filled, watertight chamber.

2.3.5.2 The stator windings and leads shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be trickle impregnated with Class H resin and shall be heat-shrink fitted into the stator housing providing for superior heat transfer. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable.

2.3.5.3 The motor shall be designed for continuous duty while handling pumped media of up to 40°C (104°F). The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

2.3.5.4 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C (104°F) ambient and shall have a NEMA Class B maximum
operating temperature rise of 80°C (176°F). A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

2.3.6 **Cable Entry Seal**

2.3.6.1 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.3.7 **Cooling System**

2.3.7.1 Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

2.3.8 **Volute**

2.3.8.1 Pump volute shall be single-piece grey cast iron, ASTM 48, Class 30, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.

2.3.9 **Impeller**

2.3.9.1 The impeller shall be of gray cast iron, ASTM 48-76, Class 30, dynamically balanced, single-shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request.

2.3.9.2 Impeller shall be taper collet fitted and retained with an Allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

2.3.10 **Paint Standard**

2.3.10.1 The exterior of the pump, including all metal surfaces coming into contact with the pumpage shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer and finished with a polyester, epoxidized resin paint.
2.3.10.2 Prior to the final paint finish being applied, the pump components shall be primed and washed. The components shall then be assembled and washed a second time before the final topcoat is applied. The finish paint or topcoat shall be applied externally to a minimum dry film thickness of not less than 100 microns. The film thickness shall be consistent with ISO 2808, method no.6.

2.3.11 Pump Shaft

2.3.11.1 Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI type 304 stainless steel.

2.3.11.2 The use of stainless steel sleeves to protect a lesser grade of shaft material will not be considered equal.

2.3.12 Mechanical Seal

2.3.12.1 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate.

2.3.12.2 The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating tungsten carbide rings.

2.3.12.3 The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating ceramic/carbon seal rings. Each seal interface shall be held in contact by its own spring system.

2.3.12.4 The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

2.3.12.5 Independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.
2.3.12.6 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. The seal lubricant shall be non-toxic and FDA approved for potable water applications.

2.3.13 Bearings

2.3.13.1 The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Sleeve or single row lower bearings are not acceptable.

2.3.14 Protection

2.3.14.1 All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

2.3.14.2 A leakage sensor shall be available to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm and, if desired, stop the motor. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 140°C (284°F) SHALL NOT BE ALLOWED.

2.3.14.3 The thermal switches and FLS shall be connected to a Control & Status monitoring unit mounted in the control panel.

2.3.15 Performance Guarantee & Standard Tests

2.3.15.1 The pump performance shall conform to ISO 9906:1999. The tests are intended to ascertain the performance of the pump and to compare this with the manufacturer’s guarantee.

2.3.15.2 The performance test of the pump(s) shall be carried out to determine the performance of the pump with respect to the discharge rate of flow, total head, power absorbed, etc. For a combined motor-pump unit (for example, submersible pump; or separate pump and motor with overall efficiency guaranteed), the guarantee covers the efficiency of the entire unit.
2.3.15.3 The pump shall be tested for proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment according to ISO 9906.

2.3.15.4 On demand, the pump supplier will supply the following test results:

- Hydraulic test curve, proving that the pump meets the operating conditions in accordance with ISO 9906:1999, Annex A;
- Current and power consumed during the test.
- Megger Test - verification of the electrical resistance to ground
- Wet Test - Submerged functional test and electrical verification of the rated current
- Dry Test - Test for 15 secs. Minimum in a dry condition with verification that current or power consumption draw does not exceed the normal dry rating
- Water Infiltration & Oil Check
- Monitoring Device Check - includes, but is not limited to, motor temperature sensors and leakage detectors
- Hydrostatic Test of the pump volute or the complete pump unit and Vibration Test shall be conducted when specifically requested by the Owner.

2.3.16 Experience

2.3.16.1 The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.

2.3.16.2 Preference will be given to the supplier who can offer temporary pump replacement on short notice from an existing rental fleet, containing an adequate inventory of pumps and accessories.

2.3.16.3 Preference will also be given to the supplier who can offer local parts and labor service by factory trained technicians.

2.3.17 Control

2.3.17.1 A control system specifically designed for pumping stations, must be used in order to provide monitoring and transfer to a back-up pump when required, to ensure a maximum degree of protection and assurance of continuity of service.

2.3.17.2 Refer to section 15900 for details on controls.

2.3.18 Standard of Acceptance

2.3.18.1 Flygt MP series, Flygt FP series, ABS Piranha series
2.4 NON-CLOG TYPE PUMPS

2.4.1 Application

2.4.1.1 Suitable for both wet and dry installation. Hydraulics with open or closed, single or multi-vane impellers suitable for handling of clear water, polluted water, sewage, abrasive matter, sewage containing up to 3” diam. solids, faecal slurry and sludge.

2.4.2 Pump Design

2.4.2.1 The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well.

2.4.2.2 Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal, watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

2.4.3 Approvals

2.4.3.1 The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. An approval of the motor unit only will not be acceptable.

2.4.3.2 The pump/motor unit is also approved by CSA for service in Class I, Division II, Groups A, B, C or D hazardous locations.

2.4.4 Pump Construction

2.4.4.1 Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blowholes or other irregularities. All exposed nuts or bolts shall be of AISI type 304 stainless steel. An approved, sewage resistant coating shall protect all metal surfaces coming into contact with the pumpage, other than stainless steel or brass.

2.4.4.2 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
2.4.4.3 Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.4.5 Motor

2.4.5.1 The pump motor shall be a NEMA-B design induction type with a squirrel cage rotor, shell type design and be housed in an air filled, watertight chamber. The stator windings and leads shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F).

2.4.5.2 The stator shall be trickle impregnated with Class H resin and shall be heat-shrink fitted into the stator housing providing for superior heat transfer. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable.

2.4.5.3 The motor shall be designed for continuous duty while handling pumped media of up to 40°C (104°F). The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

2.4.5.4 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C (104°F) ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C (176°F). A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

2.4.6 Cable Entry Seal

2.4.6.1 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single, cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessaries using the same entry seal.
2.4.7 Cooling System

2.4.7.1 Motors are sufficiently cooled by the surrounding environment or pumped media. A water cooling jacket is not required.

2.4.8 Volute

2.4.8.1 Pump volute shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

2.4.9 N-Impeller

2.4.9.1 The impeller shall be of semi-open, multi-vane, backswept, non-clog design. The impeller vanes shall be self-cleaned upon each rotation as they pass across a relief groove(s) located in the pump housing (or in an insert ring in the pump housing) and shall keep the vane clear of debris, maintaining an unobstructed pumping.

2.4.9.2 The impeller(s) shall have heavily back swept leading edges with a specific angle distribution enabling the capability of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Impellers shall be locked to the shaft. The clearance between the pump housing/insert ring and the impeller shall be adjustable. The impeller shall be of grey cast iron (ASTM A48 Class 35B) with hardened edges.

2.4.10 Paint Standard

2.4.10.1 The exterior of the pump, including all metal surfaces coming into contact with the pumpage shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer and finished with a polyester, epoxidized resin paint. Prior to the final paint finish being applied, the pump components shall be primed and washed. The components shall then be assembled and washed a second time before the final topcoat is applied. The finish paint or top-coat shall be applied externally to a minimum dry film thickness of not less than 100mm (microns). The film thickness shall be consistent with ISO 2808, method no.6.

2.4.11 Pump Shaft

2.4.11.1 Pump and motor shaft shall be the same unit and shall be made of AISI type 431 stainless steel throughout. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable.

2.4.11.2 The use of stainless steel sleeves to protect a lesser grade of shaft material will not be considered equal.
2.4.12 Mechanical Seals

2.4.12.1 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two, totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate.

2.4.12.2 The lower, primary seal unit, located between the pumped liquid and the lubricant chamber, shall contain one stationary and one positively driven rotating tungsten-carbide ring.

2.4.12.3 The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary tungsten-carbide seal ring and one positively driven rotating carbon seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

2.4.12.4 The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

2.4.12.5 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. The seal lubricant shall be non-toxic and FDA approved for potable water applications.

2.4.13 Spin-Out™

2.4.13.1 In order to reduce wear of the lubricant chamber, open surfaces of the seal, seal surfaces, and increase reliability of the seal itself, the lubricant chamber shall incorporate a specially designed seal chamber. The seal chamber houses the outer seal and consists of a spiral track in the wall of the seal chamber. This spiral track catches particles and transports them out towards the impeller, into the main rotational flow, where they are discharged back into the pump medium.
2.4.14 Protection

2.4.14.1 All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

2.4.14.2 A leakage sensor shall be included to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. Use of voltage sensitive solid state sensors and trip temperature above 125°C (260°F) shall not be allowed.

2.4.14.3 The thermal switches and FLS shall be connected to a Control & Status monitoring unit mounted in the control panel.

2.4.15 Bearings

2.4.15.1 The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row, or sleeve lower bearings are not acceptable.

2.4.16 Performance Guarantee & Standard Tests

2.4.16.1 The pump performance shall conform to ISO 9906:1999. The tests are intended to ascertain the performance of the pump and to compare this with the manufacturer’s guarantee. The performance test of the pump(s) shall be carried out to determine the performance of the pump with respect to the discharge rate of flow, total head, power absorbed, etc. For a combined motor-pump unit (for example, submersible pump; or separate pump and motor with overall efficiency guaranteed), the guarantee covers the efficiency of the entire unit.

2.4.16.2 The pump shall be tested for proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment according to ISO 9906.

2.4.16.3 On demand, the pump supplier will supply the following test results:

- Hydraulic test curve, proving that the pump meets the operating conditions in accordance with ISO 9906:1999, Annex A;
- Current and power consumed during the test.
- Megger Test - verification of the electrical resistance to ground
- Wet Test - Submerged functional test and electrical verification of the rated current
• Dry Test - Test for 15 secs. Minimum in a dry condition with verification that current or power consumption draw does not exceed the normal dry rating

• Water Infiltration & Oil Check
• Monitoring Device Check - includes, but is not limited to, motor temperature sensors and leakage detectors
• Hydrostatic Test of the pump volute or the complete pump unit and Vibration Test shall be conducted when specifically requested by the Purchaser.

2.4.17 Experience

2.4.17.1 The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.

2.4.17.2 Preference will be given to the supplier who can offer temporary pump replacement on short notice from an existing rental fleet, containing an adequate inventory of pumps and accessories.

2.4.17.3 Preference will also be given to the supplier who can offer local parts and labor service by factory trained technicians.

2.4.18 Mix Flush Valve

2.4.18.1 A mix flush valve shall be supplied separately. It shall be mounted by the mechanical contractor, on the volute of one of the pumps in the pump station. The function of this valve is to divert a part of the pumped liquid back into the sump during the first 30 seconds of pumping. This creates a powerful jet, which stirs up the sump and thus prevents settling and the accumulation of hazardous gases.

2.4.18.2 The valve shall be non-electric and operated by the pressure produced by the pump. Valves mounted on the discharge connections, discharge or riser pipes are not acceptable. Neither additional control systems nor modifications to control panels or equipment shall be necessary.

2.4.19 Control

2.4.19.1 A control system specifically designed for pumping stations, must be used in order to provide monitoring and transfer to a back-up pump when required, to ensure a maximum degree of protection and assurance of continuity of service.

2.4.19.2 Refer to section 15900 for details on controls.
2.4.20 Standard of Acceptance:

2.4.20.1 Flygt NP series, ABS AFP series

2.5 EFFLUENT WATER PUMPS

2.5.1 Application

2.5.1.1 Clear liquids or liquids containing large soft solids or for trash. and fluids containing stringy materials that tend to "rope".

2.5.2 Pump Design

2.5.2.1 The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal contact. No portion of the pump shall bear directly on the sump floor.

2.5.3 Approvals

2.5.3.1 The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. An approval of the motor unit only will not be acceptable.

2.5.3.2 The pump/motor unit is also approved by CSA for service in Class I, Division 2, Groups A, B, C or D hazardous locations.

2.5.4 Pump Construction

2.5.4.1 Major pump components shall be of grey cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by an approved sewage resistant coating.

2.5.4.2 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
2.5.4.3 Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.5.5 Motor

2.5.5.1 The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, EEMAC B type. Liquid filled motors shall not be considered equivalent. The stator windings and leads shall be insulated with moisture resistant Class F insulation rated for 155°C (311°F).

2.5.5.2 The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable.

2.5.5.3 The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and pump shall be designed and assembled by the same manufacturer.

2.5.5.4 The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.10. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C (176°F).

2.5.5.5 The power cable shall be sized according to the CEC and CSA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 20 metres.

2.5.5.6 The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

2.5.6 Cable Entry Seal
2.5.6.1 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal.

2.5.7 Cooling System

2.5.7.1 Motors are sufficiently cooled by the surrounding environment or pumped media. A water cooling jacket is not required.

2.5.8 Volute

2.5.8.1 Pump volute shall be single-piece grey cast iron, Class 30, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

2.5.9 Impeller

2.5.10 The impeller shall be dynamically balanced, non-clogging. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. The impeller shall be retained with an Allen head bolt. All impellers shall be coated with alkyd resin primer.

2.5.11 Paint Standard

2.5.11.1 The exterior of the pump, including all metal surfaces coming into contact with the pumpage shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer and finished with a polyester, epoxidized resin paint. Prior to the final paint finish being applied, the pump components shall be primed and washed. The components shall then be assembled and washed a second time before the final topcoat is applied. The finish paint or top-coat shall be applied externally to a minimum dry film thickness of not less than 100 microns. The film thickness shall be consistent with ISO 2808, method no.6.

2.5.12 Pump Shaft

2.5.12.1 Pump and motor shaft shall be the same unit and shall be made of type 431 stainless steel throughout. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable.
2.5.12.2 The use of stainless steel sleeves to protect a lesser grade of shaft material will not be considered equal.

2.5.13 Mechanical Seal

2.5.13.1 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal shall be tungsten-carbide/tungsten-carbide standard. The upper seal shall be ceramic/carbon. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.

2.5.14 Protection

2.5.14.1 Thermal switches set to open at 125°C shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel.

2.5.14.2 Each pump is also supplied with a float leakage sensor (FLS) in the stator housing. When activated, the FLS will stop the motor and send an alarm both local and/or remote. Use of voltage sensitive solid state sensors and trip temperature above 125°C shall not be allowed.

2.5.14.3 The thermal switches and FLS shall be connected to a Control & Status monitoring unit mounted in the control panel.

2.5.15 Bearings

2.5.15.1 The pump shaft shall rotate on two single row ball bearings. Motor bearings shall be permanently grease lubricated.

2.5.16 Performance Guarantee & Standard Tests

2.5.16.1 The pump performance shall conform to ISO 9906:1999. The tests are intended to ascertain the performance of the pump and to compare this with the manufacturer's guarantee. The performance test of the pump(s) shall be carried out to determine the performance of the pump with respect to the discharge rate of flow, total head, power absorbed, etc. For a combined motor-pump unit (for example, submersible pump; or separate pump and motor with overall efficiency guaranteed), the guarantee covers the efficiency of the entire unit.
2.5.16.2 The pump shall be tested for proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment according to ISO 9906.

2.5.16.3 On demand, the pump supplier will supply the following test results:

2.5.16.4 On demand, the pump supplier will supply the following test results:

- Hydraulic test curve, proving that the pump meets the operating conditions in accordance with ISO 9906:1999, Annex A;
- Current and power consumed during the test.
- Megger Test - verification of the electrical resistance to ground
- Wet Test - Submerged functional test and electrical verification of the rated current
- Dry Test - Test for 15 secs. Minimum in a dry condition with verification that current or power consumption draw does not exceed the normal dry rating.
- Water Infiltration & Oil Check
- Monitoring Device Check - includes, but is not limited to, motor temperature sensors and leakage detectors
- Hydrostatic Test of the pump volute or the complete pump unit and Vibration Test shall be conducted when specifically requested by the Purchaser.

2.5.17 Experience

2.5.17.1 The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.

2.5.17.2 Preference will be given to the supplier who can offer temporary pump replacement on short notice from an existing rental fleet, containing an adequate inventory of pumps and accessories.

2.5.17.3 Preference will also be given to the supplier who can offer local parts and labor service by factory trained technicians.

2.5.18 Control

2.5.18.1 A control system specifically designed for pumping stations, must be used in order to provide monitoring and transfer to a back-up pump when required, to ensure a maximum degree of protection and assurance of continuity of service.

2.5.18.2 Refer to section 15900 for details on controls.
2.5.19 Standard of Acceptance:

2.5.19.1 Flygt CP series, ABS AFP series.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Prior to operating the pumps, the manufacturer’s representative shall inspect the work, including installation of the pumps, guide rails, break-away fittings, level detection devices, lifting devices and pumps controller. Any deficiencies reported by the manufacturer’s representative shall be corrected prior to testing the system.

3.1.2 Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.

3.1.3 Supply and install pumps with all accessories, as specified herein; provide power for pumps operation and controls. Provide adequate length of power supply cable and controls wiring to suit the depth of the pit and distance to power supply junction box.

3.1.4 When any defects are detected, correct defects and repeat test.

3.1.5 Prior to installation in the pit, establish correct rotation and mechanical integrity of the pumps.

3.1.6 Seal conduits penetrating sump covers or walls to prevent the escape of gases.

3.1.7 Ensure that access frames are positioned such that access and removal of the pumps is possible. Coordinate with concrete formwork trades.

3.1.8 Ensure that pump body does not support weight of piping.

END OF SECTION
PART 1   GENERAL

1.1   DESCRIPTION

1.1.1  Discharge sanitary/storm water from sump pumps.

1.1.2   SUBMITTALS

1.1.3  Submit in accordance with Section 15010, shop drawings, product data, and samples for the following:

   1.1.3.1  Pipe and equipment supports.
   1.1.3.2  Pipe and tubing, with specification, class or type, and schedule.
   1.1.3.3  Pipe fittings, including miscellaneous adapters and special fittings.
   1.1.3.4  Flanges, gaskets and bolting.
   1.1.3.5  Valves of all types.
   1.1.3.6  Strainers.

PART 2   PRODUCTS

2.1   SANITARY VENT PIPING AND FITTINGS

2.1.1  For above ground vent piping, type DWV copper to:

   2.1.1.1  ASTM B306-81 for copper tube.
   2.1.1.2  CSA B158.1-1976 for cast brass fittings.
   2.1.1.3  ANSI B16.29-1973 for wrought copper fittings.
   2.1.1.4  Solder: tin-lead, 50:50, to ASTM B32-76, type 50A.
   2.1.1.5  ASTM B88-83.

2.2   PIPE AND TUBING – PUMPED DISCHARGE

2.2.1  Steel: ASTM A53 Grade B, seamless or ERW, Schedule 40.

2.3   FITTINGS FOR STEEL PIPE

2.3.1  50 mm (2 inches) and Smaller:

   2.3.1.1  Screwed or welded.
   2.3.1.2  Butt welding: ASME B16.9 with same wall thickness as connecting piping.
   2.3.1.3  Forged steel, socket welding or threaded: ASME B16.11.
   2.3.1.4  Screwed: 150 pound malleable iron, ASME B16.3. 125 pound cast iron, ASME B16.4, may be used in lieu of malleable iron. Bushing reduction of a single pipe size, or use of close nipples, is not acceptable.
2.3.2 65 mm (2 1/2 inches) and Larger:

2.3.2.1 Welded or flanged joints.

2.3.2.2 Butt welding fittings: ASME B16.9 with same wall thickness as connecting piping. Elbows shall be long radius type, unless otherwise noted.

2.3.2.3 Welding flanges and bolting: ASME B16.5:

2.3.2.4 Weld neck or slip on, plain face, with 6 mm (1/8 inch) thick full face neoprene gasket suitable for 104 degrees C (220 degrees F).

2.3.2.5 Flange bolting: Carbon steel machine bolts or studs and nuts, ASTM A307, Grade B.

2.3.3 Unions

2.3.3.1 ASME B16.39.

2.3.4 Welded Branch and Tap Connections

2.3.4.1 Forged steel weldolets, or branchlets and threadolets may be used for branch connections up to one pipe size smaller than the main. Forged steel half couplings, ASME B16.11 may be used for drain, vent and gage connections.

2.4 SCREWED JOINTS

2.4.1 Pipe Thread: ANSI B1.20.

2.4.2 Lubricant or Sealant: Oil and graphite or other compound approved for the intended service.

2.5 CHECK VALVES

2.5.1 Features

2.5.1.1 Works both vertically and horizontally (in the latter case, place the “bulge” in the “up” position, thus the ball returns to its seat by the pull of gravity).

2.5.1.2 Ball has sufficient weight to seat tightly and moves freely to open.

2.5.1.3 Low head losses as the ball is set completely to one side at a maximum rate of flow.

2.5.1.4 Works in silence.

2.5.1.5 No maintenance.

2.5.1.6 Easy dismantling.

2.5.1.7 Supplied with clean out port and plug.
2.5.2 Applications:

2.5.2.1 Waste water or fluids of varying viscosity, liquid manure, etc

2.5.3 Specifications:

2.5.3.1 1¼" & 2", Cast Iron

- Housing: ASTM Class 30 Cast Iron
- Ball: Natural Rubber
- Plug: Schedule 40 PVC
- Temperature: 150°F (51 °C) and a potential peak of 100 °C.
- Pressure Test: 100 Lbs./Sq. In.(7.0 kgs/sq. cm).

2.5.3.2 4" & 6" Flanged, Cast Iron

- Housing: ASTM Cast Iron
- Seal: Natural Rubber
- Ball: Natural Rubber Covered Hollow Iron
- Hardware: 18-8 Stainless Steel
- Access Plate: ASTM Class 30 Cast Iron
- Temperature: 176°F (80 °C)
- Pressure Test: 25 Lbs./Sq. In.(8.8 kgs/sq. meter).

2.5.3.3 Standard of Acceptance: Crane, Jenkins, Toyo, Kitz

2.6 GATE VALVES

2.6.1 50 mm (2") diam and under, screwed:

2.6.1.1 Rising stem: to MSS SP-80-1974, class 125, 860 kPa, bronze body, solid wedge disc, screwed bonnet, solid wedge disc.

2.6.1.2 Threaded ends, full ports, back seat, integral bronze seat, recommended for WOG

2.6.1.3 Standard of Acceptance: Jenkins, Crane, Toyo, Kitz.

2.6.2 65 mm (2½") diam and larger, flanged:

2.6.2.1 Rising stem: to MSS SP-70-1976, ASME B16.10, ASME B16.1, class 125, 860 kPa, FF flange, cast-iron body, OS&Y bronze trim. Tapered solid wedge disc, body guide ribs, renewable bronze seat rings, stem with acme double threads, non-asbestos packing and gaskets

2.6.2.2 Standard of Acceptance: Jenkins, Crane, Toyo, Kitz.
2.7 FLEXIBLE DISCHARGE COUPLING

2.7.1 The Flexible Discharge Couplings are designed to dampen or suppress noise, absorb vibration (horizontal, vertical, angular), accommodate thermal expansion and stresses, and adjust or correct for misalignment in piping systems.

2.7.2 Each Coupling is equipped with an outer braid to prevent elongation under internal pressure. The braid is a tubular sheath of metal wires woven in a basket weave fashion. It is made to fit snugly over the hose, and is fastened to the ends of the hose. It is designed to be strong enough to withstand elongation for the full pressure rating of the hose.

2.7.3 Inner Corrugated Hose: 300 Series Stainless Steel

2.7.4 Outer Braid: 300 Series Stainless Steel

2.7.5 Maximum Permanent Offset From Center Line: 1/2" (13mm)

2.7.6 Maximum Intermittent Offset From Center Line: 1/4" (6.3mm)

2.7.7 Threaded -50 mm (2") diam and under - or flanged -65 mm (2½") diam and larger

PART 3 EXECUTION

3.1 GENERAL

3.1.1 The drawings show the general arrangement of pipe and equipment but do not show all required fittings and offsets that may be necessary to connect pipes to the gravity discharge system. Provide all necessary fittings, offsets and pipe runs based on field measurements and at no additional cost to the Owner. Coordinate with other trades for space available and relative location of pumping equipment and accessories to be connected. Pipe location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.

3.1.2 Store materials to avoid excessive exposure to weather or foreign materials. Keep inside of piping relatively clean during installation and protect open ends when work is not in progress.

3.1.3 Support piping securely.

3.1.4 Install piping generally parallel to walls and column center lines, unless shown otherwise on the drawings. Space piping, including insulation, to provide 25 mm (one inch) minimum clearance between adjacent piping or other surface. Unless shown otherwise, slope drain piping down in the direction of flow not less than 25 mm (one inch) in 12 m (40 feet). Provide eccentric reducers to keep bottom of sloped piping flat.
3.1.5 Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the drawing.

3.1.6 Offset equipment connections to allow valving off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line take offs with 3 elbow swing joints where noted on the drawings.

3.1.7 Connect piping to equipment as shown on the drawings.

3.2 UNIONS

3.2.1 Space between the unions: max. 5 ft.

3.3 PIPE JOINTS

3.3.1 Welded: Beveling, spacing and other details shall conform to ASME B31.1 and AWS B2.1.

3.3.2 Screwed: Threads shall conform to ASME B1.20; joint compound shall be applied to male threads only and joints made up so no more than three threads show. Coat exposed threads on steel pipe with joint compound, or red lead paint for corrosion protection.

3.3.3 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.

3.4 FLEXIBLE JOINTS

3.4.1 Install in accordance with the manufacturer’s instruction, on the common discharge pipe.

3.4.2 Provide couplings as required to allow for the quick replacement of the flexible coupling.

3.5 LEAK TESTING ABOVEGROUND PIPING

3.5.1 Inspect all joints and connections for leaks and workmanship and make corrections as necessary, to the satisfaction of the Consultant. Tests may be either of those below, or a combination, as approved by the Owner and shall last no less than 4 consecutive hours:

3.5.2 Leak testing: refer to section 15010 for leak pressure testing and procedures.
PART 1  GENERAL

1.1  SUBMITTALS

1.1.1  Submit in accordance with Section 15010, shop drawings, manufacturer’s literature and data for the following:

1.1.1.1  Access doors
1.1.1.2  Level Monitoring Devices
1.1.1.3  Guide rails and attachments
1.1.1.4  Break-Away Fittings
1.1.1.5  Pump Stands
1.1.1.6  Cable Protection Assemblies
1.1.1.7  Lifting Devices

1.1.2  All accessories to be supplied by the pump manufacturer and be fully compatible with the pumps and controllers.

1.1.3  All accessories to be supplied with all the necessary subassemblies (plates, bolts, anchors, hinges, nuts, chains, etc) as required to make them fully operational and suitable for the sump conditions (depth, footprint, construction material).

1.2  STANDARD OF ACCEPTANCE

1.2.1  ITT Flygt, ABS Pumps

PART 2  PRODUCTS

2.1  SUMP ACCESS DOOR

2.1.1.1  Single- or double-leaf door as required for access and maintenance.

2.1.1.2  Material shall be 6061-T6 aluminum for bars, angles, and extrusions. 1/4” diamond plate shall be 5086 aluminum. Exterior of frame, which comes in contact with concrete, shall be coated with black bituminous paint.

2.1.1.3  Safety grate rated at 14.4 kPa (300 lbs/sq.ft.). Cover without safety grate is rated at 7.2 kPa (ISO lbs./sq.ft.).

2.1.1.4  Each door shall be equipped with a cover stay. Door shall lock open in the 90 degree position. Hatch frame shall be of extruded aluminum, with a continuous anchor flange.

2.1.1.5  Cover hinges shall be grade 316 stainless steel. Hinge shall be fastened to the frame extrusion and diamond plate with grade 316 stainless steel bolts and ny-lock nuts.
2.1.1.6 All hardware shall be stainless steel except for the rail nuts, which shall be in aluminum. Each hatch shall be supplied with a recessed padlock clip.

2.1.1.7 Padlock provided by GO Transit

2.1.1.8 Each access door shall be designed to combine covering of the opening, fall through protection and controlled confined space entry.

2.1.1.9 Grate openings shall allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.

2.1.1.10 Design must assure that the fall through protection is in place before the doors can be closed, thereby protecting the next operator.

2.1.1.11 Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90 degree position once opened. Grates in the open position create a visual barrier around the opening, alerting passing pedestrians.

2.1.1.12 Each grate shall have a pull opening arm, designed so the grate can be pulled opened, with the grate acting as a barrier between the operator and the pit.

2.1.1.13 The opening arm shall also be equipped with a controlled confined space entry lock (lock provided by GO Transit). When locked this device will aid in controlling unauthorized entry to the confined space. The grating system will allow anyone to make visual inspection and float adjustments without entering the confined space.

2.1.1.14 Each aluminum safety grate shall be coated with a safety orange color, promoting visual awareness of the hazard. The coating is a thermosetting, powder coat finish with a minimum thickness of 2-4 mils. And shall be baked at 350-375 degrees F until cured.

2.1.1.15 Standard of Acceptance: Flygt, ABS

2.2 LEVEL DETECTION

2.2.1 Level detection shall include the following parameters:

2.2.1.1 Pumps Off
2.2.1.2 One Pump On
2.2.1.3 Two Pumps On (where duplex systems are employed)
2.2.1.4 Alarm Level – interface with building BAS and local audio-visual alarm
2.2.2 The alarm level should be below the invert of the lowest inlet pipe discharging into the pit.

2.2.3 The Pumps Off level should be adequately located above the bottom of the pit to avoid de-priming the pump(s). The height of any stand or support shall be taken into account.

2.2.4 The ultrasonic level sensors used to measure a liquid level and to give a signal to a control system. The ultrasonic level transmitter is designed to be mounted above a liquid and will measure the distance to the liquid surface.

2.2.5 The sensor shall be specially developed to withstand a harsh environment and for media typical for sump pumps: sewage, slurry and viscous liquids (not foamy surface).

2.2.6 The ultrasonic sensor is a two wire 24V DC loop powered transmitter and may be connected to any suitable DC power source using the factory fitted cable, ingress protection IP 68.

2.2.7 The output is a standard 4 - 20 mA direct current, proportional to the measured level.

2.2.8 The ultrasonic sensor transmitter may be mounted in a hazardous area provided that it is supplied from a protected power supply.

2.2.9 The sensor shall be fully compatible with the pump controller equipment.

2.2.10 Electrical data

2.2.10.1 Power supply: 12 - 40 V DC, two-wire system
2.2.10.2 Power supply Ex: 12 - 30 V DC, in hazardous area zone 0, two-wire system
2.2.10.3 Output signal: 4 - 20 mA
2.2.10.4 Communications: HART digital communication (rev 5)
2.2.10.5 Grounding: Not required
2.2.10.6 Cable size: ø 4mm, 2x0,22 mm²
2.2.10.7 Cable length: 20 m
2.2.10.8 Media temperature: -40°C - 60°C
2.2.10.9 Temperature drift: ±0,015% of total range per °C

2.2.11 Physical Data

2.2.11.1 Material and Operating Body Material: PVC (stabilized)
2.2.11.2 Cable sealant: Epoxy adhesive
2.2.11.3 Locknut: Nylon
2.2.11.4 Cable: PVC cable, shielded, two core
2.2.11.5 Bracket: Stainless steel
2.2.11.6 Length of sensor: 228 mm (incl. bracket 288 mm)
2.2.11.7 Diameter of sensor: 62 mm (largest measure)
2.2.11.8 Ingress protection: IP68 (5 m H2O)
2.2.11.9 Mounting: Stainless steel mounting bracket
2.2.11.10 Position dependent: As vertical as possible, to ensure a good echo (beam angle 12°)

2.2.12 Approvals

2.2.12.1 Electromagnetic compatibility, EMC: ref.no. 89/336/EEC, 92/31/EEC
2.2.12.2 Standard: EN 61326 + A1
2.2.12.3 Machinery Directive: ref.no. 98/37/EC
2.2.12.4 ATEX Directive: ref.no. 94/09/EC
2.2.12.5 Standard: EN 50014+A1+A2, EN 50020, EN 50284
2.2.12.6 Certificate number: BAS01ATX1061X
2.2.12.7 CSA Ex standard: CAN/CSA E60079

2.2.13 Standard of Acceptance: Flygt LSU-100 series

2.3 LIFTING EQUIPMENT

2.3.1 Lifting Davit

2.3.1.1 Rated at 300 kg, including mounting recessed-in-floor socket of galvanized steel c/w bolting material, 4" diam pipe pole with davit mounting socket, chain attachment.

2.3.1.2 Standard of Acceptance: Flygt part 13-52 01 44

2.3.2 Chain Hoist

2.3.2.1 Suitable for pumps up to 750 kg, c/w hook and hand chain, pump lifting chain and chain holder. Weight: 24 kg.

2.3.2.2 Standard of Acceptance: Flygt 13-43-00 06

2.3.3 Chain Hook

2.3.3.1 Stainless steel, supplied with a stainless steel 316 bolt 3/8"-16 UNC x 1” long, nut and lock washer.

2.3.3.2 Standard of Acceptance: Flygt 13-542-04-51

2.3.4 Lifting Device

2.3.4.1 The lifting device consists of the following components:
2.3.4.2 A short length of chain attached to the pump handle, suitable for 540 kg

2.3.4.3 A length of stainless steel cable attached to the chain

2.3.4.4 A grip eye attached to the lifting equipment hook

2.3.4.5 Standard of Acceptance: Flygt 13-50 05 56 c/w lifting equipment hook

2.4 BREAK-AWAY FITTINGS (BAF) AND GUIDE RAILS

2.4.1 The stationary portion of the BAF consists of a specially designed cast iron base elbow which is bolted to a raised concrete pad of the wet well floor or to a steel base plate attached to the sump floor.

2.4.2 The pump bolts to the bronze moveable portion which is free to ride up and down the guide rails. An O-Ring is pressed into a dovetailed groove on the tapered face of the moveable. The tapered faces of the moveable and base elbow allow for a positive mating of the O-Ring to base. This elastomer to cast iron contact assures a complete and positive seal which allows pumps to operate without hydraulic leakage, unlike units with metal to metal faces. These mating parts also allow a Non-Sparking joint which is required in Hazardous Locations.

2.4.3 The guide rails are attached to the base elbow at one end and to the intermediate and upper stainless steel holders bolted into the pit structure.

2.4.4 For the top of the pit, use a stainless steel Guide Cap which is attached to the underside of the wet well cover at the top end. Both the Guide Cap assembly and the base elbow have cast iron plugs with O-Rings mounted in them which aid in locating the guide rails and in reducing noise and vibration of the guide rails.

2.4.5 An intermediate guide stainless steel bracket shall be used for depths of 13 feet (4M) or more.

2.4.6 The guide rails serve only to guide, they carry none of the pump weight. 1½” or 2" (38mm or 50 mm) schedule 40 galvanized steel pipe shall be used for guide rails.

2.4.7 Standard of Acceptance: Flygt, ABS (fitting, guide rails and supports to suit pump).

2.5 CABLE PROTECTION ASSEMBLY

2.5.1 The power supply cables to the pumps shall be protected by a system consisting of the following:

2.5.1.1 A length of up to 3 m of 3/16” stainless steel chain to hold protection system
2.5.1.2 An upper cable clamp assembly located approx. 0.5 m above the maximum water level in the pit

2.5.1.3 A protective 25 mm diam. stainless steel flexible hose shrouding the power cabling. The flexible hoses come in lengths of max. 3 m. and can be attached to match any depth.

2.5.1.4 A lower cable clamp assembly located at the pump.

2.5.2 Protective system shall include 3 power+1grounding+4 monitoring conductors, rating 90°C.

2.5.3 Standard of acceptance: Flygt 13-41 00 xx (to suit pump).

2.6 PUMP STANDS

2.6.1 Where recommended by the manufacturer, supply and install pump stands to maintain the minimum distance between the bottom of the pumps and the sump floor.

2.6.2 The Pump Support Stand shall be fabricated of 300 series stainless steel with rubberized pads on the feet to eliminate damaging the basin floor.

2.6.3 Standard of Acceptance: ITT Flygt, ABS.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Install all accessories in strict accordance with the manufacturer’s instructions.

3.1.2 Make all electrical and controls wiring connections between the level detection devices and the digital controller. Verify the correct operation of the level detection equipment.

3.1.3 Coordinate the installation of lifting devices with local conditions affecting the work, including available clearances, position of access doors and position of the pumps.

3.1.4 Coordinate with the structural division the concrete embedding of all access doors and frames, support plates, anchors, plates and hooks. Ensure that the embedded elements are in the correct position.
3.2  **BREAK-AWAY FITTINGS**

3.2.1 All components of the break-away fittings (fixed elbow and pump-attached fitting) shall be fully compatible with the selected pumps and when assembled, shall make for a water-tight connection.

3.2.2 The positioning of the guide rails and the selection of the rails diameter shall suit the type of pump used.

END OF SECTION
PART 1    GENERAL

1.1    GENERAL

1.1.1 Supply, install and commission an automatic control systems governing the operation of the sump pump equipment as specified herein and shown on the drawings.

1.1.2 Allow sufficient time for start-up and commissioning prior to placing the control systems in permanent operation.

1.1.3 Perform an in-depth review of all the effluent ejection system components (pumps, level controllers, cables, etc). Immediately report any defective or inoperative components to the Consultant.

1.1.4 Co-ordinate and supervise the work of all sub-contractors required to complete the scope of work as specified in the contract documents.

1.1.5 Provide all necessary power wiring and hardware to complete the entire project, including but not limited to, wiring, fittings, connectors, conduits, hangers/supports, box covers and all other accessories required to ensure complete, safe and fully operational systems.

1.1.6 Arrange for Electrical Authority inspection of all electrical work. Submit the Certificate of Inspection and Product Approval Certificate with the as-built documentation.

1.2    SCOPE

1.2.1 The pump manufacturer shall supply a completely assembled control panel for the operation of one or two submersible pump(s) of the capacity indicated in the equipment schedules.

1.2.2 The control panel shall be suitable for the type of pumps used. It shall include a microprocessor controller and fault diagnostic system for the control and the surveillance of a pumping station.

1.3    STANDARD OF ACCEPTANCE

1.3.1 Flygt APP 521 Controller, ABS PC 242 Controller
PART 2 PRODUCTS

2.1 CONTROL PANEL

2.1.1 All parts are of the best industrial quality designed for extended, reliable and maintenance-free operation under extremely cold and warm weather conditions. Electromechanical components are limited to a strict minimum.

2.1.2 The enclosure is of heavy industrial quality in accordance with EEMAC to provide reliable indoor or outdoor operation. The box is fitted with a heavy steel inner door which is hinge-mounted, and an exterior door (if necessary) with a 135° angle opening to allow easy access to the components.

2.1.3 The control panel is equipped with a main disconnect switch mechanically interlocked with the inner door to electrically isolate the components of the control panel when the inner door is opened.

2.1.4 For ratings up to 100A, the main disconnect switch is of the fusible type with fuses rated at 100,000A short circuit capacity. For capacities above 100A, the main disconnect switch is a thermal-magnetic circuit breaker having a fast response, high interrupting capacity and sealed contact chambers with clear covers for inspection.

2.1.5 Each pump circuit is fitted with a three-pole thermal-magnetic circuit breaker or current limiting motor protector with instantaneous magnetic trip and overload relay. The response time under short circuit conditions is less than one-quarter of a cycle; the action opens all poles thus avoiding single phase operation of three-phase pumps.

2.1.6 Isolated rotary handles for each motor protector is mounted on the inner door.

2.1.7 The circuit breaker and overload relay exhibits stable operation under changing temperature conditions from 25°C below zero up to 40° above zero. The circuit breaker has a high interrupting capacity independent of the thermal setting.

2.1.8 Each pump circuit is fitted with a three-pole fast-acting magnetic contactor, designed for a minimum of 20 years service under normal operating conditions of pumping stations. Under overload conditions, the circuit is designed to clear the fault by opening the motor protector or circuit breaker and then the contactor.

2.1.9 The control panel is fitted with a MANUAL/OFF/AUTO switch to allow manual pump operation.

2.1.10 The control panel is equipped with not less than 100 Watt heating element with a thermostat and a protective shield around the heating element to prevent accidental injuries.
2.1.11 The control panel and operate the pump(s) as per the following sequence:

2.1.11.1 Float FLL: Indicating a low level alarm and stopping of pump(s)-
backup ctrl
2.1.11.2 Probe: Start/stop/alternate the pump(s)
2.1.11.3 Float FLH: Indication of a high level alarm and starting of pump(s)-
backup ctrl
2.1.11.4 Float FLOV: overflow alarm float.

2.1.12 A microprocessor-based control with fault diagnostics and display is used to provide failsafe operation of the sewage pumping station. The controller can fulfill, but is not limited to the following functions:

2.1.12.1 Controls the starting, stopping and, if necessary, alternation of the pumps. An adjustable software time delay from zero to fifty seconds, before the starting of a pump is available to prevent the high inrush current which would result if both pumps were started at the same time.

2.1.12.2 Registers the running time of each pump running separately and of two pumps running together. It also registers the number of start-ups of each pump.

2.1.12.3 Has Max Run Time function available and settable by the user. This function limits a one pump running time to a preset value forcing pump’s stop & alternation.

2.1.12.4 Measures the pumps current consumption and activates an alarm if the reading deviates from the minimum and the maximum adjustable levels.

2.1.12.5 Allows for the protection of operating parameters using a password.

2.1.12.6 Allows for the selection of the operation of one or two pumps in parallel.

2.1.12.7 Measures the total number of hours during which the overflow float has been activated.

2.1.12.8 Allows for the selection of an adjustable software time delay from zero to sixty seconds, during which an alarm has to be present in order for the alarm signal to be issued. This avoids the signal of false alarms caused by erroneous measurements, or the transmission of these alarms to the service personnel.

2.1.12.9 Constantly monitors the pump to verify if there is no leakage or any rising of the motor winding. If a pump overheats, the controller stops it before overheating. The controller provides the same protection for leakage. For any one of two abnormal situations, the controller stops the faulty pump and activates an alarm.
2.1.12.10 Detects and signals the following alarms: high level, low level, and for each pump, motor overload, leakage, high temperature as well as overflow and power failure. The operator can acknowledge these alarms using the alarm register channel.

2.1.12.11 Is able to store the last 100 alarms in a FIFO (First in, First out) file, with the date and the hour of occurrence. The recording of the alarms are made in chronological order.

2.1.12.12 Has a operator interface, easy to use, for reading and modification of the operating parameters and also for retrieving alarms. A normal text is displayed, as opposed to a modified one. Therefore the modification of the operating parameters is simple and does not require a programming specialist. Text of the optional alarms can be modified by user.

2.1.12.13 Is equipped to read the signals generated by the ultrasonic level detectors, to monitor the well level. From the reading, the controller starts/stops or alternates the operation of the pumps. The discrete start/stop signals can be used as an alternative settable using operator interface.

2.1.12.14 Using a modem, the controller can establish an interactive communication with the GO Transit BAS central digital control system. By doing so, the controller will accept remote commands such as modification of the starting or stopping parameters. The controller will also allow remote transmission of alarms and data acquisition.

2.1.12.15 Allows for the selection of the type of communication. That is a commuted line, fixed line or radio. In case of commuted line, the controller allows for the selection of the number of ring signals before it will respond. Micro-switches are pre-set for the selected communication system.

2.1.12.16 Stores, under normal and overflow conditions, the pump operating parameters, (pumps' running time, number of starts-ups). This data is automatically transmitted to the central system, every 24 hours.

2.1.12.17 Is protected against signal interference that could occur in the pumping stations. In order to reduce the sensibility of these signal interference's, all inputs and outputs are galvanically isolated from ground.

2.1.12.18 Has a memory board allowing recording of set points and operating values. The information is recorded in a Nickel Cadmium EPROM battery, even in case of power failure.
2.1.12.19 Is equipped with LED type lights indicating the operational functions, the communication interactions and the Alarms State.

2.1.12.20 Signals the transmission and reception of data using LED type lights. It also indicates the type of transmission (alarm, report, trend, etc.). A reference number identifies each station.

2.1.13 The Controller is equipped with:

2.1.13.1 16 digital inputs: 8 for pumps’ signals (over-temperature, overload, contactor feedback, pump in AUTO mode), 4 for level control with floats (STOP, START1, START2, HIGH LEVEL) and 4 configurable: (Leakages for each pump, low level, overflow, power failure etc.)

2.1.13.2 3 analogue inputs: 1 for level reading probe, 2 for pump current

2.1.13.3 6 digital outputs: 2 for pump start/stop signal, 1 for alarm signal, 3 additional outputs are configurable by user (example: remote reset of pump overload)

2.1.14 The controller is supplied with a 120 W, has a power consumption of 40 VA and an operating temperature range from 0°C to 50°C.

2.2 COMMUNICATION

2.2.1 The control panel shall be SCADA ready to communicate with the AquaView central system located at the City Treatment facility.

2.2.2 Necessary filters shall protect the modem.

2.3 HI-LEVEL WATER ALARMS

2.3.1 Upon activation of the alarm level sensor, the controller shall:

2.3.1.1 Generate an alarm via the building BAS (where applicable).
2.3.1.2 Generate a local audio-visual alarm via a loudspeaker and strobe light.
2.3.1.3 Audio-visual local alarm devices to be installed in the building supervisor’s office. All wiring supplied and installed by the mechanical contractor.

2.4 ACCESSORIES

2.4.1 The panel shall be equipped with a monitoring relay for leakage detection and stator high temperature model miniCAS II as fabricated by ITT Flygt. In case of a malfunction, the monitoring relay should stop the pumps. On a high temperature detection a pump shall not be made available until a manual reset has been performed.
2.4.2 The panel will receive high and low level indication from two ENM-10 floats. The floats shall be mercury free.

2.4.3 The control panel shall be equipped UPS provide approximately three (3) hours of back-up.

2.4.4 The control panel shall be supplied with the following equipment mounted on the inner door:

2.4.4.1 Three (3) time totalizers; one for each pump and one for parallel operation of two pumps. For parallel operation, the individual time totalizers shall not record the time but only the third one.

2.4.4.2 An ammeter per pump with phase selector.

2.4.4.3 A voltmeter with phase selector.

2.4.5 The control panel shall be supplied with a protective relay against phase failure and phase reversal.

2.4.6 The control panel shall be supplied with lightning arrester and surges capacitors.

2.4.7 An alarm silencing push button shall be present to stop the alarm from unnecessary operation once the station operator has taken notice of the fault.

2.4.8 The control panel shall be in accordance to the specifications and the wiring.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

3.1.1 Install in strict accordance with the manufacturer’s instruction and manuals.

3.1.2 Provide complete identification and labeling for new and existing devices and equipment.

3.1.3 Provide new cabling, conduits, control cabinets, power supplies and other auxiliary equipment, as required for a complete operational system.

3.2 INSTALLATION

3.2.1 Installation shall include computer programming, drawings, supervision, adjusting, validating and checkout, cable, and field wiring necessary for complete operational system including generation of graphics.
3.3 POWER SOURCES AND WIRING METHODS

3.3.1 All wiring shall be installed in EMT conduit unless specified otherwise.

3.3.2 Install EMT and cable at right angles to building lines, securely fastened, and in accordance with current electrical codes and standards.

3.3.3 Power for control system shall not be obtained by tapping into miscellaneous circuits that could be inadvertently switched off. Only dedicated circuit(s) shall power the control system. Provide additional breakers or electrical panels as required.

3.3.4 Mount transformers and other peripheral equipment in panels located in serviceable areas. Provide line-side breakers/fuses for each transformer.

3.4 CUTTING AND PATCHING

3.4.1 All cutting, patching, painting and making good for the installation of the work shall be done by the Contractor. All cutting shall be performed in a neat and true fashion, with proper tools and equipment to the Consultant’s approval. The surfaces shall be made good to reasonably match existing finishes to the Consultant’s approval.

3.5 IDENTIFICATION AND LABELLING OF EQUIPMENT

3.5.1 All panels must have a lamicoid tag (min. 3”x1”) affixed to the front face indicating panel designation and function (i.e. “Pump Panel 1” or “Relay Panel 3”).

3.5.2 All field control equipment panels fed from more than one power source must have a warning label on the front cover.

3.5.3 All rotating equipment controlled automatically shall have a tag or label affixed indicating that the equipment may start without warning.

3.6 SUBSTANTIAL COMPLETION INSPECTION

3.6.1 At the completion of the site hardware inspection, the Contractor shall test and verify that the system programming and alarm features are operating correctly and is in compliance all requirements of the specifications.

3.6.2 The Contractor shall provide written notification to the Owner’s representative that the site is ready for the Substantial Completion Inspection by the Consultant.

3.6.3 At the conclusion of the Substantial Completion Inspection, the Consultant shall issue a comprehensive site deficiency report to the Contractor for his immediate action.
3.6.4 The Contractor shall correct all items noted in the site deficiency report within ten (10) business days of receipt.

3.6.5 The Contractor shall provide written notification to the Owner’s representative that all items on the Consultant’s site deficiency report have been corrected.

3.7 TRAINING

3.7.1 Provide four (4) hours of operator training per facility. The allocation of training hours and the number of participants shall be determined by GO Transit. The training hours may be divided up over several training sessions. The number of trainees to be determined by GO Transit but shall not exceed 8 for any one session. Training may take place on site, at another GO Transit location, at the Contractor’s office or any combination thereof.

3.7.2 Training shall include an explanation of the drawings, operations and maintenance manuals, a walk through of the site to locate control components, an explanation of the controller and control panels operation/function, and an explanation of the adjustment, calibration, and replacement procedures.

END OF SECTION
PART 1  GENERAL

1.1  DESCRIPTION

1.1.1 Aluminium Fixed Vertical Ladder including ladder, wall mounting brackets, floor mounting brackets and side rail.

1.2  SUBMITTALS

1.2.1 Submit shop drawings for all the ladder components (handrails, treads, all brackets).

1.3  SYSTEM DESCRIPTION

1.3.1 The system is an aluminum ladder designed to be attached to a wall.

1.3.2 Floor mounting brackets are furnished when ladder bottom is at floor level.

1.3.3 A safety cap at the top of the stringers if furnished on ladders requiring same.

1.3.4 Standard riser height is 12”.

1.4  DELIVERY, STORAGE, AND HANDLING.

1.4.1 Examine ladder when it arrives on site. Notify the carrier and manufacturer of any damage.

1.4.2 Store ladder until installation under roof, if possible; or, if stored outside, under a tarp or suitable cover.

1.5  WARRANTY

1.5.1 The unit carries a limited warranty of one (1) year against defective material and workmanship, covering parts, labor and freight. Defective parts, if deemed so by the manufacturer, shall be replaced no charge, upon inspection on site by the manufacturer's representative.

1.6  MAINTENANCE

1.6.1 Under normal usage, the ladder shall require no preventive maintenance.

PART 2  PRODUCTS

2.1  LADDER

2.1.1 Side Rail: Aluminum channel. (6005-T5), 2½"x1-1/16"x1/8". A 1/8” molded polyurethane safety cap provided at top.
2.1.2 Floor Bracket: aluminum, 2½” x 2”x3” angles, mounted to the side rail with four ¼”x¾” stainless steel bolts. 1/8” hole for bolt-fastening to the floor.

2.1.3 Treads: Extruded aluminum (6005-T5), 2¼”x¾”x¼”. Treads deeply serrated for safety, suitable for 1,000 lbs (454 kg) load. Treads are attached to the side rail using ¼”x3/8” rivets. Distance between consecutive treads: 12” (300 mm).

2.1.4 Wall Mounting Bracket: aluminum angle 8½”x4½”x3”x¼” attached to the side rail with three ¼”x¾” stainless steel bolts. The bracket shall maintain the side rail at 8½” distance from the pit wall. Bracket contains a 9/16” hole for bolting to the pit wall. Typical distance between consecutive wall brackets: 48” (1,200 mm).

2.2 FABRICATION
2.2.1 The ladder is completely fabricated ready for installation before shipment to the site.

2.3 FINISHES
2.3.1 Mill finish on aluminum ladder components.

2.4 STANDARD OF ACCEPTANCE
2.4.1 Precision Ladders LLC

PART 3 EXECUTION
3.1 INSTALLATION
3.1.1 Install per the manufacturer's installation instructions.

END OF SECTION
PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 System includes:

1.1.1.1 Modular railing system.
1.1.1.2 Self-closing safety gate.
1.1.1.3 Pipe and attachment fittings

1.2 REFERENCES

1.2.1 Occupational Safety & Health Administration (OSHA): 29 CFR 1910.23 - Guarding Floor and Wall Openings and Holes.
1.2.2 Occupational Safety & Health Administration (OSHA): 29 CFR 1926.501 - Duty to Have Fall Protection.
1.2.3 Occupational Safety & Health Administration (OSHA): 29 CFR 1926.502 - Fall Protection Systems Criteria and Practices.
1.2.4 Occupational Safety & Health Administration (OSHA): 29 CFR 1926.503 - Training Requirements.

1.3 SUBMITTALS

1.3.1 Submit in accordance with the requirements of section 15010 the following:

1.3.1.1 Manufacturer's data sheets on each product to be used, including:
1.3.1.2 Preparation instructions and recommendations.
1.3.1.3 Storage and handling requirements and recommendations.
1.3.1.4 Installation methods.

1.4 SHOP DRAWINGS:

1.4.1.1 Drawings showing plans, elevations, sections and details of components.
1.4.1.2 Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer’s full range of available colors and patterns.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Deliver materials to the job site in good condition and adequately protected against damage as handrails are a finished product.
1.5.2 Inspect rail sections for damage before signing the receipt from the trucking company. Truck driver must note damaged goods on the bill of lading if damaged product is found.

1.5.3 Store products in manufacturer's unopened packaging until ready for installation.

1.6 FIELD MEASUREMENTS:

1.6.1 Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication.

1.7 WARRANTY

1.7.1 Provide manufacturer's two (2) year warranty.

PART 2 EQUIPMENT

2.1 MODULAR RAILING SYSTEM:

2.1.1 Provide metal handrail system utilizing handrail brackets, handrail fittings and hex key for assembly.

2.1.2 System shall have top and mid rail in accordance with OSHA Standards - 29 CFR 1910.23 (a)(2).

2.1.3 Height: 42 inches (1067 mm), minimum.

2.1.4 Railings: 1-1/2 inch pipe (1.90 inch (48 mm) OD).

2.1.5 Material: Mild steel, hot-dip galvanized with powder-coated finish. Color: Safety yellow

2.2 SELF-CLOSING SAFETY GATE

2.2.1 Fully assembled gate shall be capable of swinging in either direction by inverting installation position. Gate size shall be laterally adjusted from minus 1-1/4 inch (32 mm) to plus 2-1/2 inch (64 mm).

2.2.2 Standards: System shall have top and mid rail in accordance with OSHA Standards - 29 CFR 1910.23 (a)(2).

2.2.3 Width: As indicated on Drawings.

2.2.4 Height: Top Rail: 42 inches (1067 mm), minimum. Bottom Rail: 21 inches (533 mm).
2.2.5 Hardware: Provide the following:

2.2.5.1 Gate Hardware: U-Bolts.
2.2.5.2 Universal Hinge Assembly: Fits railing types up to 2 inches (51 mm) O.D. or flat surface mounting.
2.2.5.3 Railing adapter kit.
2.2.5.4 Self-Closing Springs: Two stainless steel torsion springs.

2.2.6 Material: Mild steel, hot-dip galvanized with powder-coated finish. Color: Safety yellow

2.2.7 Standard of Acceptance: Bluwater Manufacturing Inc.

2.3 RAIL ASSEMBLY FITTINGS

2.3.1 Provide fittings required for a complete operational system that meets OSHA requirements. Below is a partial list of required fittings; contractor shall provide additional fittings as required to suit the local conditions and make the railing system fully operational and securely attached to the building elements.

2.3.2 Single Socket Tee

2.3.2.1 Designed to give a 90° butt joint between two pipes. Frequently used for the joint between end uprights and the middle rail on safety railing where the site is straight and level. Also for base ties on racking.

2.3.3 Side Outlet Tee

2.3.3.1 90° Side Outlet Tee to give a 90° corner joint for the middle rail of safety railing and other rectangular structures. The upright passes through the fitting.

2.3.4 90° Elbow

2.3.4.1 A 90° elbow joint, most frequently used as an end joint for the top rail of safety railing on a level site.

2.3.5 Two Socket Cross

2.3.5.1 Two Socket Cross to give a 90° joint between the middle rail and an intermediate upright on safety railing. The upright passes through the fitting.

2.3.6 Three Socket Tee

2.3.6.1 Three Socket Tee most commonly used as the 90° joint between the top rail and an intermediate upright on safety railing. As there are two socket
set screws in the sleeve, this fitting can be used where a join is required in the horizontal pipe. The Type 10 fitting can be used as an alternative when a join in the pipe is not required.

2.3.7 Side Outlet Elbow

2.3.7.1 A 90° corner joint most frequently used for the top rail of safety railing. It can also be considered for the corner joint of benches, work tables, and other rectangular structures.

2.3.8 Standard Railing Flange

2.3.8.1 Used when a structural fixing is required to the floor or to the wall. When fixing guard railing and balustrades, Type 62 should always be used. The holes are of sufficient diameter to insure proper fixing with either a mechanical or chemical anchor. The two set screws in the vertical socket give greater sideload stability to the upright. It is recommended that the fixing holes in the flange should be in line with the applied load.

2.3.9 Straight Coupling

2.3.9.1 Designed to form an inline joint between two pieces of pipe of the same size.

2.3.10 Standard of Acceptance: Bluwater Manufacturing, Kee Safety Inc.

PART 3 EXECUTION

3.1.1 Install in strict accordance with the manufacturer's instructions and literature

3.1.2 Assemble components with joints tightly fitted and secured. Accurately form components to suit installation.

3.1.3 Do not begin installation until substrates to which the railing system shall be attached have been properly prepared.

3.1.4 Protect installed products until completion of project.

3.1.5 Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION