

1. General

1.1 Scope

- 1.1.1 This specification, and references noted herein define the minimum requirements for the design, manufacturing, supply, inspection, packing, shipping, testing and quality assurance of the sanitary sewage pumps.

The pumping stations shall include, but not be limited to, submersible pumping units, all internal piping and valves, lifting chains, guide bars, lifting davit, vents complete with screens, cover, electrical wiring, control panel with circuit breakers and motor starters.

1.2 Related Sections

- 1.2.1 Section 01 33 00 – Submittal Procedures.
- 1.2.2 Section 01 78 00 – Close Out Submittals.

1.3 Codes and Regulations

1.3.1 General

- The scope of supply shall comply with all federal, provincial and municipal codes, regulations and ordinances that apply for this type of work and that are in force at the time of execution of the work.
- The equipment supplied shall be in accordance with this specification, the applicable codes and standards, reference specifications, and drawings.
- In the event of conflict between the reference codes and standards, drawings, and specifications, the Contractor shall obtain clarification before proceeding with the work.

1.3.2 Codes and Standards Organizations

- Unless specifically stated otherwise, the design and fabrication of mechanical equipment and systems shall be in accordance with the relevant parts/sections of codes, standards and regulations issued by the following authorities and technical organizations:

ABMA American Bearing Manufacturers Association

ACA American Chain Association (formerly American Sprocket Chain Manufacturing Association, ASCMA)

AGMA American Gear Manufacturers Association

ANSI American National Standards Institute

ASCE American Society of Civil Engineers

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials International
AWWA	American Water Works Association
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
CWB	Canadian Welding Bureau
HI	Hydraulic Institute
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrumentation, Systems and Automation Society
NBC	National Building Code
NEMA	National Electrical Manufacturers Association

1.3.3 Canadian National and Provincial Codes

- Machinery Standards are covered by the following Acts and Regulations and their latest amendments:
 - ♦ Occupational Health and Safety Act as Amended Chapter O-3.
 - ♦ Consolidated Newfoundland and Labrador Regulation 1165/96 Occupational Health and Safety Regulations under the Occupational Health and Safety Act (O.C. 96-478).
 - ♦ Workplace Health, Safety and Compensation Act as Amended Chapter W-11.
 - ♦ Consolidated Newfoundland and Labrador Regulation 1025/96 Workplace Health, Safety and Compensation Regulations under the Workplace Health, Safety and Compensation Act (O.C. 96-574).
 - ♦ Public Safety Act (O.C. 96-427).
- The design and fabrication of equipment and components shall conform to the requirements of the latest edition of the above codes, as well as all other applicable Federal and Provincial codes, standards and regulations in effect.
- Equipment is required to carry the CSA mark with a CSA declaration of conformity provided.

1.3.4 Language and Measurement System

- All units shall be in accordance with the International System of Units (SI), which has been adopted by the International Organization for Standardization (ISO). Exceptions to this rule shall apply to cable numbering, which shall be in accordance with the American Wire Gauge designations (AWG and MCM).

1.4 Operating Conditions

1.4.1 General Description

- The equipment shall be located in an enclosed, unheated, underground chamber. This environment will be humid and potentially corrosive.

1.4.2 Site Conditions

- The equipment shall be designed and supplied to provide continuous, long-term service under the ambient and environmental conditions that will prevail on site.

1.5 Design Criteria

1.5.1 Duty

- The equipment shall be designed and built for a continuous mode of operation, based on 24-hours per day, 365 days per year without requiring excessive maintenance, repairs and long work stoppages.
- All equipment shall be of the best quality and construction to ensure a minimum equipment design life of 15 years.

1.6 Shop Drawings

1.6.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.6.2 Submit shop drawings for civil, structural, hydraulic, mechanical and electrical elements. Indicate individual components by manufacturer's model number and accompany with technical and performance characteristics.

1.6.3 Submit project records as per the submittals schedule, complete with Inspection and Testing Plans (ITP), for pre-approval prior to construction.

1.7 Closeout Submittals

1.7.1 Provide data to produce record drawings, including details of pipe material, maintenance and operating instructions in accordance with Section 01 78 00 - Closeout Submittals.

1.7.2 Include the following information:

- Record drawings, wiring diagrams, electrical schematics of equipment as installed.
- Interconnections with numbers and wire sizes.
- Certified pump characteristic curves.
- Detailed operation and maintenance instructions.

- Spare parts list comprising a complete schedule clearly identified to facilitate re-ordering.

1.8 Waste Management and Disposal

- 1.8.1 Separate waste materials for reuse and recycling.

2. Products

2.1 Wet Well Structure

Not applicable. The wet well structure is integral to the septic tank.

2.2 Pumps

- 2.2.1 Pumps shall be horizontal, single stage, bottom suction, non-clog, heavy duty, totally submersible, self-priming centrifugal pumps. No portion of the pump shall bear directly on the floor of the chamber.
- 2.2.2 Major pump components shall be of grey cast iron, ASTM-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of ANSI type 316 stainless steel. In accordance with manufacturer's recommendations, a sewage resistant coating shall protect all metal surfaces, other than stainless steel or brass, coming into contact with sewage.
- 2.2.3 Volute casing: single piece of grey cast iron, ASTM-48, Class 35B, with smooth passages of sufficient size to pass any solids that may enter the impeller.
- 2.2.4 Impeller: grey cast iron, ASTM-48, Class 35B, semi-open, in static and dynamic balance.
- 2.2.5 Pump shaft: type 431 stainless steel shaft, pump and motor shaft shall be a single piece unit.
- 2.2.6 For the sewage pumps located in the septic tanks, each pump shall be selected to perform under the following operating conditions:
- Sewage pumps (duplex system):
 - ♦ Flow rate (single pump): 30 L/s.
 - ♦ Total dynamic head: 6.0 m.
 - ♦ Duty: one operating, one standby.

2.3 Pump Removal System

- 2.3.1 Pumps shall be complete with two sliding guide bars and brackets, chains and quick leak-proof disconnect to discharge piping, all allowing for withdrawal of pumps.

2.3.2 Provide galvanized steel lifting chain for each pump accessible from roof access hatches. The working load of the lifting chains shall incorporate a 4:1 safety factor.

2.3.3 Provide galvanized steel pipe to act as quick rails for pump.

2.3.4 Provide one galvanized lifting davit that can swing in such a manner that it allows removal of either pump.

2.4 Submersible Motors

2.4.1 Motor enclosure and seal housing: corrosion resistant, completely watertight, cast iron.

2.4.2 Terminal box: watertight, with waterproof cable entry glands mounted at motor.

2.4.3 Motor leads and power cords shall be sealed and locked in place using strain bushings. All cables to be waterproof.

2.4.4 Motor shall be capable of withstanding at least 15 starts per hour.

2.5 Instrumentation Requirements

2.5.1 All field bus instruments must be pre-wired to a junction box with the remaining control instruments pre-wired to a separate junction box. Contractor shall separate process bus signal cabling from discrete and power signal cabling.

2.5.2 Instrument junction boxes shall be NEMA 4X. All NEMA 4X boxes shall be type 304 stainless steel. All instrument junction boxes shall have a hinged, lockable door with rail mounted terminals.

2.5.3 The Contractor is to supply a detailed control narrative defining the control requirements of the equipment including P&IDs, control loops, interlocks and alarms, control sequences and any special functions.

2.6 Specific Instrumentation Requirements

2.6.1 Contractor shall supply all instruments deemed necessary to safely operate and effectively monitor the process and mechanical performance of the equipment.

2.6.2 Level measurement by float level measurement.

2.6.3 The Contractor shall include a breakout price for this equipment as part of their bid.

2.7 Piping and Valves

2.7.1 Provide means to connect discharge pipe to force main. Reducers and other fittings shall be included in the pumping packages.

2.7.2 Provide butterfly valves and check valves for each pump discharge.

2.8 Electrical Control Panel and Wiring

- 2.8.1 All components to be CSA approved.
- 2.8.2 Electrical equipment in wet wells to requirement for Hazardous Locations, Zone 1, Group D, Division 2.
- 2.8.3 Wiring between panel and wet well shall pass through intermediate junction box using epoxy-coated, rigid, galvanized steel conduits. For sewage pumping stations, install conduit seals between panel and junction box.
- 2.8.4 Panel enclosure shall be NEMA 4X. All NEMA 4X boxes shall be type 304 stainless steel. All enclosures shall have double door equipped with locking device, suitable for pole mounting. Devices shall not be mounted on outer door of panel.
- 2.8.5 Panel to be complete with required components including but not limited to:
- One (1) main circuit breaker with thermal magnetic trip and suitable current rating for station load.
 - One (1) motor circuit interrupter with toggle handle for each pump motor with adjustable instantaneous trip.
 - One (1) magnetic full voltage starter with 120 volts coils and three (3) overload relays for each pump.
 - One (1) time delay-relay, 2-50 second range, 10 amp minimum resistive contacts to prevent concurrent starting of pumps after power restoration.
 - Dry contacts, normally open, on high water alarm relay for remote indication.
- 2.8.6 Mount following switches and instrumentation on inner door of panel:
- Pump mode selector switches for hands-off-automatic operation of each pump.
 - Pump sequence selector switch to permit override of automatic pump alternation and selection of either pump to run as lead pump.
 - One (1) high level alarm complete with alarm relay and red light on panel door.
 - One (1) pump outage alarm complete with alarm relay and red light on panel door.
- 2.8.7 Terminals in circuit of start float switch of lag pump.
- 2.8.8 Ground connection lug.
- 2.8.9 Labels: all components on and inside panel to indicate operating routine. Labels to be anodized aluminum with 5 mm minimum letters.
- 2.8.10 Schematic wiring diagram: mounted inside panel door, varnish protected.

2.8.11 Conductors: copper.

2.8.12 Control wiring: minimum # 14 AWG, stranded type TEW with insulation.

2.8.13 Power wire: minimum # 12 AWG, type RW 90 with insulation.

2.8.14 Wire:

- Numbered with printed permanent indelible identifying plastic tapes to correspond to schematic diagram.
- Terminated for external control connections by tubular screw type terminal blocks with barrier and labels.
- Equipped with grommet and shields for mechanical protection.
- Adequately supported and installed to approval of Departmental Representative.

2.9 Factory Testing

2.9.1 Perform operational tests on pumps at factory to check for excessive vibration, for leaks in piping or seals and for correct operation of automatic control system and auxiliary equipment. Pump suction and discharge lines to be coupled to reservoir and pumps to recirculate water for minimum of 1 hour under simulated service conditions.

2.9.2 Provide certification that pumps and controls have been factory tested and all deficiencies rectified prior to delivery to site.

3. Execution

3.1 Equipment Installation

3.1.1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.2 Field Quality Control

3.2.1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Departmental Representative.

3.2.2 Test in presence of Departmental Representative and representative from equipment supplier.

3.2.3 Provide labour and ancillary equipment necessary to fulfill tests.

3.2.4 Test to demonstrate that:

- Pumps and equipment run free from overheating, or vibration.
- Operation meets requirements of these specifications.

- Pumps and piping are free and clear of debris and obstructions.

3.2.5 Replace equipment found defective. Repeat test until equipment is accepted by Departmental Representative.

3.3 Demonstration

3.3.1 Operating Personnel Training:

- Provide on site training by qualified personnel for designated operating personnel prior to final commissioning. Training to be in accordance with training plan approved by Departmental Representative.
- Provide training for three (3) designated personnel on all routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.
- Provide safety precaution procedures for all systems.

4. Measurement for Payment

4.1 Measurement for Payment

4.1.1 Payment for all work and materials specified in this section will be by lump sum as quoted in the Schedule of Prices. Unless specifically marked optional and not specified elsewhere all items must be supplied and installed.

4.1.2 Excavation and backfilling including compaction for septic tanks shall be paid for in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling. Measurement units shall be the plan outside dimensions plus 2 meters and shall be to the full depth of the excavation from original ground to the limits shown on the drawings.

4.2 Basis for Payment

4.2.1 Unless otherwise specified, all work under this section will be deemed included in the lump sum prices included in the Schedule of Prices.