
Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 20 Excavating, Trenching and Backfilling.
- .2 Section 33 34 00 Sanitary Utility Sewerage Forcemain.
- .3 Section 33 31 16 Public Sanitary Utility Sewerage Piping.
- .4 Section 01 33 00 - Submittal Procedures.
- .5 Section 01 78 00 - Closeout Submittals.
- .6 Section 03 41 00 - Precast Structural Concrete.
- .7 Section 01 74 11 – Cleaning.
- .8 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - .1 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
 - .2 ANSI/AWWA C504-10, Rubber-Seated Butterfly Valves.
 - .3 ANSI/AWWA C508-09, Swing-Check Valves for Waterworks Service, 2 inch (50 mm) through 24 inch (600 mm) NPS.
- .2 ASTM International
 - .1 ASTM C 478M-14, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.

1.3 SCHEDULING

- .1 Schedule work to minimize interruptions to existing services.
- .2 Maintain existing sewage flows during construction.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for packaged sewage lift and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit drawings for civil, structural, hydraulic, mechanical and electrical elements.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

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- .2 Operation and Maintenance Data: submit operation and maintenance data for sewage lift station for incorporation into manual.
 - .3 Include information as follows:
 - .1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.
 - .2 Interconnections with numbers and wire sizes.
 - .3 Certified pump characteristic curves.
 - .4 Detailed operation and maintenance instructions.
 - .5 Parts list comprising complete schedule clearly identified to facilitate re-ordering.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect packaged sewer lift from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESCRIPTION

- .1 Reinforced concrete enclosure.
 - .1 Pumping system: factory assembled and disassembled for shipment with mating components clearly identified.
 - .2 Principal items of equipment to include 2 identical submersible sewage pumping units, internal piping and valves, liquid level controls, lifting chains, guide bars, debris screen, vents complete with screens, cover, electrical wiring, control panel with circuit breakers and motor starters.
- .2 Equipment and installation including as follows:
 - .1 Temporary sheet piling.
 - .2 Excavation for sewage lift station.
 - .3 Placement of mud slab.
 - .4 Connection of power to control panel as indicated.
 - .5 Connections to force mains.
 - .6 Supply and installation of packaged sewage lift station in accordance with manufacturer's recommendations.
- .3 Wet well sewage lift station:
 - .1 Fully automatic, consisting of duplex submersible pumps mounted on rail system. Ensure control is by series of liquid level bulbs.
 - .2 Ensure pumps alternate as lead pump on each cycle.
 - .3 Incorporate time delay relays in control circuits to allow continuation of pump for pre-set time after normal pump shut down signal is received.
 - .4 Operate both pumps when lag pump "on" water level is reached in wet well.
 - .1 Ensure lag pump shuts off when water level drops to pump "off" water level.
 - .5 Locate control system in control station mounted above lift station cover plate.

2.2 WET WELL STRUCTURE

- .1 Structure: leak free, precast reinforced concrete or plastic capable of carrying the applied loads with access openings, and ladder and designed for following forces:
 - .1 Dead load of station and components, dynamic and kinetic forces of rotating equipment.
 - .2 Dead load from soil over structure, superimposed live load of 12 kN/m² or single wheel load of 54 kN over area of 750 x 750 mm.
 - .3 Hydrostatic uplift forces.
 - .4 Horizontal earth loading and full hydrostatic pressure assuming water at ground elevation.
- .2 Materials:
 - .1 Precast concrete to ASTM C478M; CAN/CSA-A257 and in accordance with Section 03 41 00 - Precast Structural Concrete.
 - .2 Plastic Tank capable of carrying the applied loads.

2.3 PUMPS

- .1 2 vertical, single stage, bottom suction, non-clog, heavy duty, totally submersible centrifugal pumps, direct connected to motor by solid stainless steel shaft and fitted with thrust bearings.
- .2 Characteristics:
 - .1 Pump to be capable of conveying septic effluent to the proposed area beds as shown on the Contract Drawings.
 - .2 Pump is to be sized so the operation point on the pumping curve occurs before the optimum operating point.
 - .3 Pump to be sized for 110% of total flow.
- .3 Volute casing: cast iron, minimum grade Class 30, close coupled.
- .4 Impeller: bronze, semi-open, in static and dynamic balance. All fasteners to be stainless steel.

2.4 PUMP LIFTING SYSTEM

- .1 Ensure pumps are complete with sliding guide and brackets, chains and quick leak-proof disconnect to discharge piping, all allowing for withdrawal of pumps.
- .2 Include galvanized lifting chain or stainless steel cable for each pump accessible from roof access hatches.
- .3 Use galvanized steel pipe as quick rails for pump.

2.5 SUBMERSIBLE MOTORS

- .1 Motors:
 - .1 3 phase.
 - .2 Capable of operating pump at any point on selected impeller curve without exceeding motor nominal rating.
 - .3 Fully overload protected.
 - .4 Assembly capable of operating continuously in air without overheating.
 - .5 Complete with NEMA approved winding temperature sensor.
- .2 Motor speed: maximum 1800 rpm.
- .3 Motor enclosure and seal housing: corrosion resistant, completely watertight, cast iron.

- .4 Bearing: anti-friction type, greasable, with lubrication lines and fittings, 50,000 hours minimum, B-10 life.
- .5 Terminal box: watertight, with waterproof cable entry glands mounted at motor.
- .6 Shaft seals: double mechanical seals with tungsten/carbide faces.
- .7 Motor leads and power cords to be sealed and locked in place using strain bushings. All cables to be waterproof.

2.6 PUMP CONTROL SYSTEM

- .1 Liquid level switches: shock-proof mercury switches enclosed in leak-proof polypropylene body.
- .2 Include independently adjustable control levels as follows:
 - .1 Lead pump start level.
 - .2 Lead pump stop level.
 - .3 Lag pump start level.
 - .4 Lag pump stop level. High water alarm.
- .3 Ensure lead pump and lag pump controls include alternator relay to provide automatic pump alteration for each pumping cycle when pump sequence selection switch is on automatic.

2.7 ELECTRICAL CONTROL PANEL AND WIRING

- .1 Use only CSA approved components.
- .2 Electrical equipment in station in accordance with requirements for Hazardous Locations, Class 1, Group D, Division 2.
- .3 Panel enclosure to NEMA 4Xweather proof of fabricated steel suitably braced, double door equipped with locking device, suitable for pole mounting.
- .4 Ensure panel is complete with required components including:
 - .1 One main circuit breaker with thermal magnetic trip and suitable current rating for station load.
 - .2 One 3 phase ground detector, neon lamp type with resistors and fuse cut-outs.
 - .3 One motor circuit interruptor with toggle handle for each pump motor with adjustable instantaneous trip.
 - .4 One magnetic full voltage starter with 120 volts coils and 3 overload relays for each pump.
 - .5 One time delay-relay, 2 - 50 second range, 10 amp minimum resistive contacts to prevent concurrent starting of pumps after power restoration.
 - .6 Dry contacts, normally open, on high water alarm relay for remote indication.
- .5 Mount following switches and instrumentation on door of panel:
 - .1 Pump mode selector switches for hands-off-automatic operation of each pump.
 - .2 Pump sequence selector switch to permit override of automatic pump alternation and selection of either pump to run as lead pump.
 - .3 One high level alarm complete with alarm relay and red light on panel door.
- .6 Terminals in circuit of start float switch of lag pump.
- .7 Ground connection lug.
- .8 Labels: all components on and inside panel to indicate operating routine.
 - .1 Labels: anodized aluminum with 5 mm minimum letters.

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- .9 Schematic wiring diagram: mounted inside panel door, varnish protected.
 - .10 Conductors: copper.
 - .11 Control wiring: number 14 AWG minimum, stranded type TEW.
 - .12 Power wire: number 12 AWG minimum, type RW 90.
 - .13 Wire:
 - .1 Numbered with printed permanent indelible identifying plastic tapes to correspond to schematic diagram.
 - .2 Terminated for external control connections by tubular screw type terminal blocks with barrier and labels.
 - .3 Equipped with grommet and shields for mechanical protection.
 - .4 Adequately supported and installed in accordance with written approval of Departmental Representative.

2.8 PACKAGE SYSTEM

- .1 Precast concrete enclosure complete with components specified.

2.9 SOURCE QUALITY CONTROL

- .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 our under simulated service conditions.
- .2 Provide certification that pumps and controls have been factory tested and deficiencies rectified prior to delivery to site.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewage lift installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 EXCAVATION BACKFILLING AND COMPACTION

- .1 Excavate, backfill and compact in accordance with Section 31 23 20 - Excavating, Trenching and Backfilling.

3.3 CONCRETE

- .1 Do concrete work in accordance with Section 03 41 00 - Precast Concrete Structures.

3.4 EQUIPMENT INSTALLATION

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

3.5 FIELD QUALITY CONTROL

- .1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Departmental Representative.
- .2 Test in presence of Departmental Representative and representative from equipment supplier.
- .3 Provide labour and ancillary equipment necessary to fulfill tests.
- .4 Test to demonstrate that:
 - .1 Pumps and equipment run free from heating, or vibration.
 - .2 Operation meets requirements of these specifications.
 - .3 Pumps and pumping are free and clear of debris and obstructions.
- .5 Replace equipment found defective.
 - .1 Repeat test until equipment is accepted by Departmental Representative.

3.6 DEMONSTRATION

- .1 Operating Personnel Training
 - .1 Provide on site training by qualified personnel for designated operating personnel prior to final commissioning.
 - .1 Schedule and deliver training in accordance with training plan approved in writing by Departmental Representative.
 - .2 Include training for 3 designated personnel on routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.
 - .3 Include safety precaution procedures for systems.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION