SECTION 11300 – SUBMERSIBLE SEWAGE PUMPS AND PUMP CONTROL PANEL

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish and install all materials, labor and equipment required to install a complete sewage pumping system including submersible, explosion proof sewage pumps, breakaway coupling, lifting rails, power cables, stainless steel pump control panel and pump control and alarm switches as shown on the construction plans and specified here in.

1.02 RELATED WORK

A. Division 16 - Section 16050 Basic Electrical Provisions.

B. Division 15, - Sections 15075 Mechanical Identification and 15100 Valves.

1.03 REFERENCED STANDARDS

A. National Electrical Code -NEC


1.04 SUBMITTALS

A. Submittals shall be in accordance with Section 01300.

B. Shop Drawings shall include:

1. Equipment specifications and data sheets identifying all materials used and methods of fabrication.

2. Complete assembly, layout, installation drawings with clearly marked dimensions.


4. Motor nameplate data.

5. Sample equipment nameplate data sheet.
6. List of special tools and spare parts.

C. Operation and Maintenance Manuals

The Contractor shall submit 8 copies of operation and maintenance manuals in accordance with the requirements of Division 1.

D. Pump and Control Panel Warranties

All pumps and control panels and accessories shall be warranted for a minimum of 2 years from the date of acceptance by the Owner.

1.05 COORDINATION

A. The Contractor shall install the pumping system in accordance with the requirements of the pump manufacturer and shall be responsible for proper installation of all guide rails, brackets, lifting chain, cables, etc.

1.06 QUALITY ASSURANCE

A. Manufacturer’s Qualifications

1. The pump manufacturer shall have a minimum of 5 years experience in manufacturing pumping systems.

B. Manufacturer’s Responsibilities

1. The pump manufacturer shall furnish a complete pumping system including pump discharge connection elbow, sliding rails and brackets, stainless steel lifting cables, power cables, etc.

C. Quality Control

Before the pumping equipment is shipped, the manufacturer shall shop running tests so as to provide certified performance curves to the Engineer.
1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall deliver, handle and store the equipment as specified under Division 1.

PART 2 – PRODUCTS

2.01 PUMP STATION PUMPS

A. General Requirements

1. Each pump shall be capable of pumping raw unscreened sewage containing 3-inch diameter spherical solids. The pumps shall be capable of handling liquids continuous and shall be capable of running dry for extended periods.

2. The pumps shall have a minimum 3-inch diameter discharge.

3. The pumps shall be designed to operate on 3 phase, 208 volt, 60 hz power.

4. Acceptable pump manufacturers and mold of the pumps shall be:

Wincoram Pumping Station:
   No. of pumps: Two (2)
   Pump Capacity: 131 gpm minimum
   Static Head: 22.05 ft.
   Total Discharge Head: 77.84 ft.
   Pump Type: Submersible, Flgyt Model No. NP3102 SH3
   Adaptive 256, Impeller 135mm, 2 blades, 3,480 RPM

Motor:
   Horsepower: 6.5
   Voltage: 208 (200) volts
   Amperage: 18 amps
   Starting current: 139 amps
B. Pump Construction

1. Major pump components shall be of gray case iron ASTM A-48, Class 35 B.

2. Pumps shall be painted with one 2 mil coat of enamel.

3. All nuts and bolts shall be AISI type 316 stainless steel.

4. The pump discharge connection shall be 125 psi flange.

C. Pump Impellers

1. Pump impellers shall be cast iron, ASTM A-48 Class 35 B, dynamically balanced, semi-open, multi-vane, back swept, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw shaped leading edges of the impeller shall be hardened to RC-45. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt volute.

2. Pump volutes shall be cast iron, ASTM A-48, Class 35-B, non-concentric design. of sufficient size to pass any solids that may enter the impeller. The volute shall have integral spiral shaped, sharp edged grooves. The internal volute bottom shall provide effective sealing between the impeller and the volute.

B. Pump Motors

1. Pump motors shall be non-overloading throughout the entire pump performance curve.

2. Pumps and motors shall be listed with Underwriters Laboratories as Class I, Group C and D, Division 1, explosion-proof.

3. All electrical parts shall be housed in an air-filled, cast iron, watertight structure enclosure.
4. The motor shaft extension and all external hardware shall be 316 stainless steel.

5. The motor windings shall have Class F insulation and a 1.15 service factor.

C. Pump Motor Sensors

1. 2 moisture-sensing probes shall be provided to detect any liquid past the outer seal.

2. Thermal sensors shall be equipped with a thermal switch embedded in the end coil of the stator winding to external motor overload protection which shall be wired to the pump control panel.

D. Pump Motor Seals

1. Pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of 2 seal sets. The lower primary seal, shall contain 1 stationary and 1 corrosion resistant tungsten-carbide ring. The secondary seal shall contain 1 stationary and 1 rotating tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Seal interfaces shall be held in place by independent spring systems. The seal springs shall be isolated from the pumped media.

2. Pump shall be provided with a lubricant chamber for the shaft sealing system. Seal lubricant chambers shall have 1 drain and 1 inspection plug that are accessible from the exterior of the motor.

3. Separate seal leakage chambers shall be provided. The leakage chambers shall be equipped with float switches that shall indicate if the chamber has reached 50% of its capacity.

E. Pump Motor Power Cables

1. Pump motor power cables shall be equipped with a minimum of 40' of submersible SO cables.

2. Cable entry shall consist of watertight and submersible dual cylindrical elastomer grommets. The seal grommets shall be
compressed by the cable entry unit, thus providing strain relief.

3. Secondary rubber pressure grommets shall be provided.

4. Pump Motors shall be furnished with a minimum of 40' of ¼” diameter, 316 stainless steel lifting cables.

2.02 SLIDING GUIDE BRACKETS, BREAK AWAY FITTINGS AND GUIDE RAILS

A. Sliding guide brackets shall be provided as an integral part of the pump casing. Brackets shall have machined angle connections with yokes to connect with the cast iron discharge connection.

F. The cast iron discharge connection shall be designed to receive the movable connection. The pump shall bolt to the movable bronze section which is free to ride up and down the guide rails. The pump connection shall be non-sparking.

G. The pump shall be bolted to the cast iron movable portion of the discharge connection.

H. The guide rails shall attach to the base elbow of the break away fitting and to the underside of the wet well top slab.

I. Guide rails shall be 2” diameter 316 stainless steel schedule 40 pipe.

J. All pipes, brackets and fasteners shall be 316 stainless steel.

2.03 PUMP CONTROL PANEL

A. The pump control panel shall be a duplex pump control panel in a NEMA 4x stainless steel enclosure with quick operating latches for 3 phase, 208 volt, 60 hz, 4 wire power. The panel shall include a main disconnect with externally operable handle.

B. Pump motors shall be supplied with a circuit breaker and an across the line NEMA rated motor starters with 3 phase overload protection.

C. A separate single phase, 120 volt control circuit shall be provided to power the Multitrode MT2PC liquid level controller.
D. The pump control panel shall provide lead-lag automatic pump alternation and high and low water alarms.

E. Pumps shall be provided with H.O.A. selector switches and a pump sequence selector switch which shall override the automatic alternation.

F. The level control system shall be Multitrode consisting of a single multi-sensored probe with a Multitrode MT2PC controller. The Multitrode shall provide a low level audible and visual alarms.

G. The pump control panel shall be provided with a weatherproof, exterior a single phase, 120 volt, 20 ampere, GFI receptacle.

H. Pumps shall be provided with running time meters.

I. The pump control panel shall be provided with Flygt Corp. C.A.S. relays, to detect pump seal failure and over temperature.

J. The pump control panel shall be provided with a phase monitoring system. The system should sense under and over voltage, voltage unbalance, phase, loss of phase and phase reversal. Upon sensing any of the above conditions the control panel should activate the alarm light, alarm horn close the alarm contact. The pump control panel should be not permit the pumps to operate until the incoming power has returned to normal. The voltage monitoring system shall be PLMU series as manufactured by ABB Inc.

K. The control panel shall provide for automatic by-pass of the Multitrode MT2PC controller the event that the back-up low level or high level floats are activated. In the event of a Multitrode by-pass, the low level float should operate as a low level alarm float only. The pump control panel shall allow the pumps to continue to run upon activation of the low level float.

L. In the event of a Multitrode by-pass, the high level float should in addition to activating a high level condition alarm, should operate as a pump on and pump off float. When this float energizes, the lead pump should activate followed by the lag pump after the built in time delay has been satisfied. The by-pass of the Multitrode unit should continue until a manual reset button has been pressed releasing the control panel from operating on the back-up floats.
M. The activation of the low level or high level floats should be shown on the pump control panel with amber indicator lights. If the pump control panel is using the back-up float system, an independent amber indicator light should activate showing that the Multitrode unit is being by-passed and that the control panel is currently using the float back-up float system. The by-pass of the Multitrode unit should continue until a manual reset button has been pressed.

N. The pump control panel shall provided with a alarm dialer as specified under Section 13800

2.04 MULTITRODE MT2PC DUPLEX INDICATING PUMP CONTROLLER

A. Multitrode MT2PC pump controller shall be installed within the pump control panel shall operate in conjunction with the multi-sensored probe in the pump station wet well using 12 volt AC voltage, 0.8 milli-ampere power.

B. The controller shall be capable of controlling and monitoring a minimum of 2 level alarms, 2 pump seal failures and 2 pump over temperature alarms.

C. The microprocessor pump controller shall include a LED indicator to monitor status and a keypad to provide for changes, and manual operation of the pump station.

D. The panel face shall also include LED indicators to display the following:

1. Pump run
2. Pump manual/off/automatic (HOA Switch)
3. Lead Pump On
4. Lag Pump On
5. Motor fault
6. Pump seal leak detection
7. Pump alternation
8. Next pump selection
9. High wet well water level alarm
10. Redundant High Water Alarm
11. Low wet well water level alarm
12. Redundant Low water Alarm

F. The keypad shall be provided with the following switches:
   1. Individual pump manual/off/automatic selection
   2. Individual fault reset
   3. Level alarm reset
   4. Pump alternation

G. The keypad shall permit changes to:
   1. Pump start and stop levels
   2. Pump start and stop delays
   3. Probe sensitivity
   4. Seal monitor sensitivity.

H. The pump controller shall accept inputs from:
   1. Multi-trode probes levels
   2. Fault devices
   3. Pump seal sensors
   4. Pump over temperature sensors.

2.06 MULTI-SENSOR LEVEL PROBES

A. Probe materials
   1. Premium quality PVC tube
   2. Avesta 254 SMO high grade stainless steel alloy
3. PVC multi-core cable
4. Epoxy resin encapsulant

B. Probe construction
   1. The exposed surfaces of the multi-sensored probe shall be constructed of PVC extruded and Avesta 254 SMO high grade stainless steel alloy.
   2. 10 sensor points of Avesta 254 SMO are to be spaced as shown on the construction drawings along the length of the probe assembly with individually numbered wires in the flexible multi-cored support cable.
   3. The probe shall be pressure injected with an epoxy resin encapsulant.

C. Probe dimensions
   1. The probe length shall be as shown on the construction plans, to the approval of the Engineer.

D. Probe installation
   1. The probe shall be installed with stainless steel mounting brackets and a cleaning squeegee, positioned at the location shown on the construction plans in the pumping station wet well.
   2. Installation shall be in accordance with manufacturer’s installation instructions and the requirements of the SCDPW and SCDHS.

2.08 LEVEL SENSORS

A. Provide 2 non mercury filled polypropylene level sensors, with 40’ of cable for connection to multitrode level sensor and multitrode controller.

B. The level sensors shall be adjusted to monitor:
   1. Redundant High Water Alarm
   2. Redundant Low Water Alarm
C. Provide intrinsically safe barrier relays to each level sensor.

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

A. All equipment supplied shall be installed in accordance with the pump manufacturer’s recommendations.

B. The Contractor shall provide piping, support, valving and electrical power and control wiring as required to install a complete pumping system, in strict conformance with the requirements of the SCDPW and SCDHS.

**3.02 INITIAL AND FINAL START-UP OF PUMPING STATION**

A. A qualified representative of the manufacturer shall test the pumping system. A preliminary test shall be conducted in the presence of the Owner’s Engineer. After approval by the Engineer a second final test shall be scheduled by the Engineer to be held in the presence of the Owner’s Engineer, the pump station operator and representatives of the SCDPW and SCDHS.

**3.03 FIELD QUALITY CONTROL**

A. The Contractor shall field test all components of the pumping system.

B. Operational tests shall include checking the operation of all pumps overload protection devices, safety interlocks, pump controls and alarms and remote alarm notification systems.

C. Under no circumstances are any portions of the pumping system to be energized without authorization from the manufacturer’s representative.

**END OF SECTION**