

## SECTION 333213.13A

### Submersible Package Pump System

#### A. Scope:

The Contractor shall furnish all labor, materials, equipment and supplies necessary for the installation of the submersible pump package as specified herein and as detailed on the Drawings. This shall include, but not be limited to, submersible pumps, all pump mounting plates, a flanged discharge elbow, a pump guide system with accessories, lifting chains, connecting electrical cable, control system and panel, check valve, spare parts and incidentals as specified herein to form a complete operating system. Pump systems shall be as manufactured by Flygt Corporation, or approved equal. All pumping equipment specified in this Section shall be the product of a single manufacturer.

#### 1. Submittals

The Contractor shall submit to the Engineer four (4) sets of documents and an electronic copy that clearly identify any special components, or options, being provided with individual systems. These documents shall include, but not be limited to, the following:

a. Pump Curves

Guaranteed performance curves for each pump, showing guaranteed flows, head, hydraulic efficiency and kW draw at the specified duty point and at minimum static head.

b. Motor Curves

Motor curves charting speed, current, power input, power factor, motor efficiency, starting current, starting power factor, no load current, no load power factor, locked rotor current, locked rotor power factor and torque characteristics.

c. Pump Outline Drawings

d. Station Drawings for Accessories

e. Detailed Electrical Data

f. Control Drawing and Data

g. Installation Guides

h. O & M Manuals

Operation and maintenance manuals shall be provided for each different pump system. The manuals shall include operating instructions, control system theory of operation, maintenance instructions, drawings with all components identified, component specification sheets, and a list of recommended spare parts.

A Component specification sheet shall be provided for each separately operable, individually configurable or semi-custom component. Each sheet shall include pertinent design data, complete descriptions of each supplied configuration, manufacturer, model number, and supplier contact number. Sheets for motors shall also include the serial numbers of the pump/motor.

For software programmable components, ASCII text copies of any custom software, or configuration settings, shall be included on Wintel PC readable media.

i. Parts List

Dimensional, installation, electrical and control wiring diagrams. These shall include complete field wiring and system interconnection drawings.

j. Printed Warranty

**2. Factory Inspection:**

The following inspections, and tests, shall be performed on each pump:

a. Electrical Connections:

Before installation, the impeller, motor rating and electrical connections shall be checked for compliance with the reviewed shop drawings.

b. Pump Cable and Motor Test:

The motor and its built-in electrical cable shall be tested for excess moisture, insulation defects and proper installation before shipment to the job site.

c. Pump Dry Run:

Before installation or submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

d. Pump Submerged Run:

Before shipment and after installation, the pump shall be run submerged for a minimum of 30 minutes while submerged at a minimum of six (6) feet under water.

e. Pump Repeat Test:

The Cable and Motor test (No. 2) shall be repeated after each Submerged Run test (No. 4).

f. Control System Test

Controls shall be factory tested for proper operation and conformance with the Specifications before shipment to the job site. Operation, and level calibration, shall also be tested after installation.

g. Inspection and Test Report:

A written report of the results of each inspection and test shall be provided. Each set of results shall be certified as true by the person performing the inspection or test.

**3. Characteristics :**

Each pump shall conform to the following:

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a. There Shall be one Duplex Package Pump Station with the following

In the station there are two Flygt \*-\*-\*- pumps with Flygt level control and starters, and 3 phase power. They shall be \* - horse power capable of pumping \*\*\* feet of total dynamic head with a flow rate off \*\*\* GPM. The discharge shall be \* inch. The cabinet for the controls shall be stainless steel NEMA 4X. Furnish the controls and accessories listed below.

Starters
Level Controllers
Control Panel
Ball Check Valve
System to alternate pumps
HOA switch
Elapsed time indicator
Discharge and base
Run Lights with light test
Alarm light
Start-Stop switch
Four floats automatic start stop
SCADA Contacts for future

**4. General**

Pumps shall be suitable for handling sewage and sludge, heavy duty, non-clogging and classed as centrifugal as defined in the "Standards of the Hydraulic Institute". Each pump shall be of the sealed submersible type as manufactured by Flygt Corporation or equal. Where shown on the Drawings, the discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the pump well during operation of the pumps or when the pumps are raised and lowered out of the wet well.

Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple downward motion of the pump unit guided by no less than two guide rails. Guide rails shall be supported at intermediate locations as required. The guide rail system shall be submitted to the Engineer for approval before installation. No portion of the pump shall bear directly on the floor of the sump. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet

a. Materials

The major components shall be of gray cast iron, Class 35B, with smooth surfaces devoid of blow holes and other irregularities. Where watertight sealing is required, O-rings made of nitrile rubber shall be used. All exposed nuts and bolts shall be of AISI

type 304 stainless steel construction. All surfaces, coming into contact with wastewater, other than stainless steel or brass, shall be protected by an approved wastewater resistant coating.

b. Sealing Surfaces

All matching surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. The fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This will result in controlled compression of nitrile rubber O-rings without the requirements of a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease or other devices shall be used.

c. Cable

The cable entry water seal design shall include specific torque requirements to insure a watertight and submersible seal. Pump motor cable installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable and sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. The free end of the cable shall be shipped enclosed in a protective, heat-shrink boot.

d. Motor

The pump motor shall be a squirrel-cage, induction, shell-type design, housed in an air-filled watertight chamber. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which will resist a temperature of 155 degrees C (311 degrees F). The stator shall be dipped and baked in accordance with Class F requirements. The motor shall be designed for continuous duty, capable of sustaining a minimum of ten (10) starts per hour. Operating voltage shall be as shown on the Drawings.

e. Cooling

Each motor unit shall be provided with an adequately designed cooling system. Thermal radiators integral to the stator housing, cast in one unit, are acceptable. The pump must be designed so that submergence in sewage is not required for proper cooling and performance as specified herein.

f. Thermal Switches

The motor shall be equipped with three (3) thermal switches, embedded in the stator windings (one to each phase) to protect the motor from overheating.

g. Moisture Detection (Oil Cavity)

The motor shall be equipped with moisture detectors, for both the motor cavity and the windings, to protect it against seal fail.

h. Shaft

The pump and motor shall have the same shaft. Couplings are not acceptable. The shaft shall be of stainless steel meeting the requirements of AISI Type 420.

i. Mechanical Seal

Each pump shall be provided with a tandem mechanical shaft seal system. The upper of the tandem set of seals shall operate in an oil chamber located just below the stator housing. This set shall contain one stationary tungsten carbide ring and one positively driven rotating tungsten carbide ring and shall function as an independent secondary barrier between the pumped liquid and the stator housing. The lower of the tandem set of seals functions as the primary barrier between the pumped liquid and the stator housing. This set shall consist of a stationary ring and a positively driven rotating ring both of which shall be tungsten carbide. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. 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 or double spring acting between the upper and lower units. The latter conventional system requires a pressure differential to offset external pressure and to effect sealing.

j. Oil Chamber

The only function of the oil chamber shall be as a secondary barrier between the pumped liquid and as a seal lubricant. It shall be designed to compensate for oil expansion that can occur due to temperature variations. The drain and inspection plugs, with positive sealing, shall be easily accessible from the outside.

k. Bearings

The pump shaft shall rotate in three permanently lubricated bearings. The upper bearing, providing for radial thrust, shall be a single row, roller bearing. The two lower bearings shall consist of two angular contact bearings for axial and radial thrust.

l. Impeller

A wearing system shall be installed to provide efficient sealing between the volute and impeller. The impeller shall be double shrouded gray cast iron of non-clogging design coated with acrylic dispersion zinc phosphate primer capable of handling solids, fibrous material, heavy sludge and other matter found in normal sewage applications. The impeller shall be constructed with a long throughlet without acute turns and dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it.

m. Volute:

The volute for "C" pumps shall be of a single piece ( For "B" pumps it shall be two piece), non-centric design and shall have smooth fluid passages large enough at all points to pass any size solids which can pass through the impeller.

n. Wear Rings

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet

o. Warranty

The pump manufacturer shall warrant all the units being supplied to the Owner in writing against defects in workmanship and material covering parts and labor for a period of five (5) years under normal use, operation and service.

**5. Control System**

Each pump system shall include controls as specified herein and shown on the Drawings. In all other ways, control systems shall comply with the requirements of the Instrumentation and Controls section of the Specifications.

a. Enclosure

Unless otherwise Indicated, all of the system's controls, except for the level sensor, shall be contained in a local control panel (LCP) installed as shown on the Drawings. Unless otherwise Indicated, the LCP shall be NEMA 4X rated, stainless steel and equipped for padlocking.

b. Motor Starters

Unless otherwise Indicated, the control system LCP shall include combination, non-reversing, full-voltage starters for each pump incorporating thermal, electrical and moisture motor protection circuits. Starters shall comply with the latest NEC.

c. Pump Operation

Pumps shall individually be set to operate either manually, or automatically, to control the level of the wet-well in which installed. Operation shall be based on user adjustable setpoints for both the start and stop level of each pump. The control system shall include high, and low, level alarms.

Available (in Auto and not Failed) pumps shall be switched through the "lead" and "lag" positions on alternate operation cycles. If the "Lead" pump does not reach its off setpoint within 24 hours of continuous running, all pumps shall be turned off, an alternation made and the control resumed as normal. A pump that fails to match its system "call" within a user adjustable time period shall be marked as Failed by the system and the next available pump reassigned its lead/lag position.

The system shall include protection against phase loss, phase reversal, under-voltage, over-voltage and surges in the supply power. It shall include circuitry to provide a minimum of 15 seconds between any pump start.

d. Switches and Indicators

Unless otherwise Indicated, the system shall include the following switches and indicators:

Hand Off Auto switch – each pump, on front panel, accessible without exposing internal components to the ambient environment. In Hand, the pump shall operate regardless of the control system, except for shutdown faults. In Off, the pump shall stop. In Auto, the pump shall operate per its on/off setpoints and lead/lag position.

Run indicator – each pump, visible without exposing internal components to the ambient environment. On when the pump is on; off otherwise.

Run Hour indicator – each pump, visible without exposing internal components to the ambient environment. This indicator shall record the total run time of each pump. It shall

be non-resettable and have a minimum of 6 digits with the least significant digit being 1/10 hour.

Fail indicator – each pump, visible without exposing internal components to the ambient environment. On when the pump does not match its “call” output and the HOA switch is in A or the pump has a shutdown fault condition; off otherwise.

Hi Temp indicator – each pump, visible without exposing internal components to the ambient environment. On when a pump’s thermal switch is tripped; off otherwise.

Moisture indicator – each pump, visible without exposing internal components to the ambient environment. On when a pump’s moisture detector is tripped; off otherwise.

Level readout-visible without exposing internal components to the ambient environment. The readout shall show wet-well level in engineering units as indicated.

Hi/Lo Level Indicator-visible without exposing internal components to the ambient environment. On when the high or low level has been exceeded; off otherwise.

Alarm horn and silence button – horn sounds when any pump has failed or any other system alarm occurs.

Alarm Reset button – resets alarms for cleared faults and enables pump starting.

Devices exposed to the ambient environment shall have the same NEMA rating as the enclosure in which mounted.

e. Status Outputs

The control system shall provide the following contact closure outputs signals for connection to the Owners SCADA system.

Pump Status – individual Form C contact closures to indicate Run and Fail for each pump( 2 each pump) Pump Fail outputs shall be true upon loss of power.

LCP Status – individual Form C contact closure to indicate LCP Door opened.

Alarm Status – one Form-isolated ,4/20mA source to repeat the wet well level. C contact closure to indicate an un-silenced (horn on) LCP alarm.

Level

f. Level Control:

The level control shall be by Floats.

(i) Float Switches

Float switches shall be sealed in solid polypropylene floats with built-in signal cable.

Float switches shall be FLYGT, Model ENM-10, or equal.

(ii) Installation

Float switches, shall be suspended in the wet-well and include any manufacturer recommended mounting hardware needed for installation as Indicated. They shall be supported as recommended by their manufacturers and signal cables shall not be stressed by bends, or mounting, beyond manufacturer’s recommendations. Their mounting location shall be selected for minimum turbulence and optimum operation.

**6. Ball Check Valve**

The Valve shall be a Flygt HDL type 5087 or equal with sinking nitrile rubber ball and cast iron body.

**7. Spare Parts**

Spare parts shall consist of a kit which contains upper and lower bearings, upper and lower seals, and O-rings. One kit shall be supplied for each installation.

**B. Payment:**

No separate payment will be made for the work of this Section unless specifically noted.. The cost of the work, and all cost incidental thereto, shall be included in the Proposal.

**END OF SECTION**