Section 11306

PACKAGE SANITARY SEWER LIFT STATION FOR ANALYZER STATION BY-PASS FLOWS

PART 1 GENERAL

1.01 SUMMARY

This Section includes the furnishing and subsequent installation of a package submersible non-clog pump station, accessories, level sensors and controls including basin, piping, valves, and appurtenances as shown on the Plans and specified herein for water sample analyzer waste streams.

1.02 MEASUREMENT AND PAYMENT

Unless indicated in the Unit Price Schedule as a pay item, no separate measurement or payment for Work performed under this Section. Include cost of same in Contract price bid for Work of which this a component part.

1.03 REFERENCES

This specification references the following publications in their current editions. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

A. ASTM A48/A48M: Standard Specification for Gray Iron Castings

B. ASTM A276/A276M: Standard Specification for Stainless Steel Bars and Shapes

C. AFBMA-9: Load Ratings and Fatigue Life for Ball Bearings

D. Hydraulic Institute (HI): Standards for centrifugal, rotary, and reciprocating pumps

E. NEMA MG-1: Motors and Generators

1.04 SUBMITTALS

Submit the following in accordance with Sections 01330 – “Submittal Procedures” - Submittals and 01782 - "Operations and Maintenance Data."

A. Shop Drawings

1. Factory-certified pump performance curve showing capacity in gpm versus total dynamic head (TDH), NPSH required, minimum submergence, brake horsepower required, operating speed, and wire-to-water efficiency. Curve to be complete from shut-off to minimum TDH.

2. Motor design data and rating, including full load amps, power factor, and kW input at rating point.

3. Dimensioned installation drawings:

   Scaled fabrication and/or layout drawings showing all equipment piping, mechanical and electrical components. The set of scale drawings shall include detailed dimensions of heights, diameter, elevation to invert, pipe sizes and any other necessary details.

4. Certification that empty wet well basin is designed to prevent uplift due to buoyancy.

5. Construction material designations by ASTM Standards

6. Control system details, including control panel arrangement and manufacturer's catalog data cut sheets on all components indicating exact models, to be furnished, as well as control schematics. Furnish control schematics reproduced from control schematics shown on the Plans with modifications as required, but not redrawn or redesigned in another format.

7. Information covering availability of parts and service

B. Operation and Maintenance Manuals

1. Assembly, installation, alignment, adjustment, and checking instructions

2. Lubrication and maintenance instructions

3. Guide to "troubleshooting."

4. Parts lists and predicted life of parts subject to wear

5. The latest set of all Shop Drawings, including field wiring diagrams

C. Certified Report

Furnish three copies of a report prepared by manufacturer's technical representative certifying satisfactory installation, operation, and in-service placement of units.

1.05 RELATED REQUIREMENTS

A. Section 01330 – “Submittal Procedures”

B. Section 01782 - "Operations and Maintenance Data"

C. Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment"

D. "ATTACHMENT" to this Section designates acceptable manufacturers, number of units, performance, sizes, motor characteristics, pump service, and special features.

E. Other related Work as called for on Plans or specified elsewhere in this or other Sections.

1.06 QUALITY ASSURANCE

A. System Coordination:

Contractor is to be responsible for all details necessary to properly install, adjust, and place in operation a working system.

B. Standardization:

All pump station components and systems to be the single source responsibility of the supplier of the package pump station.

C. Pump manufacturer to design and provide wet well basin and control system.

D. Qualifications:

1. Pump manufacturer shall be regularly engaged in the manufacture of package sanitary sewer pump stations for not less than five (5) years.

2. Structural design of the pumping station shall be accomplished by a structural engineer registered in Texas.

1.07 SYSTEM DESCRIPTION

A. The package sewage pumping station shall consist of the following major components and as indicated on plans:

1. Wet well basin

2. Pumps

3. Interior and above ground piping, valving and pipe supports

4. Electrical, instrumentation, and control systems

1.08 DELIVERY, STORAGE, AND HANDLING

Deliver, unload, and store products on site in manner that prevents damage. Use special care to prevent damage from temperature and condensation.

1.09 PROJECT/SITE CONDITIONS

Units to be capable of being installed and removed without entering wet well.

1.11 - 1.13 (NOT USED)

1.13 WARRANTY

Provide Owner with manufacturer's warranty guaranteeing pumping station components to be free from defects for five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURER(S)

A. Meyer

B. Hydromatic

C. Flygt

D. Or Approved Equal

2.02 MATERIALS AND/OR EQUIPMENT

A. Pumping Unit - Construction and Materials

1. See "ATTACHMENT" for recommended Manufacturer and Model

2. Casing:

ASTM A48/A48M Class 25 minimum, gray cast iron design to be supported from discharge elbow or with support legs; smooth rounded passages to minimize clogging

3. Impeller:

Thermoplastic vortex type

4. Pump Shaft:

Stainless steel or high carbon steel isolated from liquid pumped.

5. Enclosures:

Top, motor, and intermediate castings to be ASTM A48/A48M cast iron, Class 25 minimum.

6. Seals:

   Mechanical seal system with Buna-N elastomers, carbon and ceramic sealing faces and stainless steel metal parts

7. Motor

   a. Sized to be nonoverloading at any point on pump performance curve without exceeding 90 percent of service factor rating

   b. Premium efficiency with nominal and minimum efficiencies per NEMA MG1.

   c. Horsepower rating of motors:

      Not less than maximum brake horsepower requirements of pumps under any condition of operation specified and indicated without operating in the motor service factor.

   d. Insulation:

      Moisture resistant Class F 155° C/311° F

   e. Bearings:

      Anti-friction permanently lubricated having an L10 "rating life" of 40,000 hours at rated speed per AFBMA 9

   f. Motor Protection Devices:

      (1) Furnish stator temperature and seal chamber moisture sensors when shown on the Plans or when required by pump manufacturer's warranty.

      (2) Each phase of motor to have temperature sensors embedded in the coils of the stator winding. Sensors to be series connected and wired to motor controls to shut down pump at high temperature. High temperature shutdown to lock out motor and activate alarm. Include the motor protective relay with all required equipment for motor protection.

8. Motor Cable:

   Water resistant 18-3 SJTW-A cables in one continuous length from pumping unit to control panel. Size cables in accordance with applicable NEC specifications. Cable to be furnished and sized by pump manufacturer.

9. Provided with a Lift out ring

10. Fastenings and Fittings:

Nuts, bolts, and fastenings exposed to liquid pumped to be ASTM A276, 300 series stainless steel.

11. Motor Protection Devices:

Furnish stator temperature and seal chamber moisture sensors when shown on the Plans or when required by pump manufacturer's warranty.

Each phase of motor to have temperature sensors embedded in the coils of the stator winding. Sensors to be series connected and wired to motor controls to shut down pump at high temperature. High temperature shutdown to lock out motor and activate alarm. Include the motor protective relay with all required equipment for motor protection.

B. Accessories

1. Provide 1.5-inch (minimum) PVC discharge piping, unions, isolation and check valves within the Wet Well Basin

C. Control Panel

1. Design:

Manufacturer shall supply control panel and alarm system designed to function with pumping units, factory wired, and tested. Controls to automatically start and stop pumping unit and permit manual operation at the panel.

2. Panel:

NEMA-4X (stainless steel) construction with removable dead front behind fully hinged door with lock for outdoor, or NEMA 1 enamel-coated galvanized steel for indoor. Include terminal strip for field connections and drain. The enclosure shall be oversized to accommodate all components. Components are as follows

a. Main Service Disconnect

A three-pole, main station disconnect shall be contained within the NEMA 4 control enclosure. Disconnect shall be non-fused and isolate all power to the control enclosure. The disconnect shall have an operating handle mounted in the enclosure door, mechanically interlocked to prevent entry while disconnect is in ON position.

b. Circuit Breakers, Starters and Overloads

(1) Full voltage, non-reversing combination motor circuit protector

(MCP) starters with three ambient compensated overload relays. Starters to be NEMA Size 1 or larger.

(2) Each starter shall be protected on each power leg by a circuit breaker of the appropriate amperage. Motor starter coils shall be 120 volt operated. Overload relays shall be electronic type, ambient compensating and differential tripping type. Bi-metallic or melting alloy type overloads shall not be permitted. The overload shall protect each power leg and shall be set to the motor full-load current rating. Further protection shall include sensitivity to current imbalance and single phase conditions.

c. Control Transformer

Include fused control power transformer for each unit. Control transformer shall provide 120 volt power to the pump station controls. The control transformer shall be protected on primary and secondary sides with appropriately sized fuses. No load other than the pump controls shall be supplied by the control transformer.

d. Include Hand-Off-Automatic (H-O-A) switches for each unit.

e. Premium Surge Arrester

Surge suppressor shall meet or exceed the following criteria: Minimum single impulse current rating: 80,000 amperes per phase. Duty cycle testing: 2,500 10KA impulses with less than 10% drift. Suppressors shall consist of solid-state components and operate bi-directionally. Minimum continuous operating voltage of the suppressor shall be greater than 100% of the nominal system voltage.

f. Secondary Control Circuit Fuses

Single-pole secondary distribution fuses with appropriate ratings shall supply power to each pump starter coil circuit, the control system and to other circuits as specified.

g. Main Panel Power Phase Monitor

The incoming power shall be protected by a phase loss/low voltage system dropout relay to de-energize the pump station control circuit if either a phase failure, phase reversal or low voltage condition occurs. If after attempted automatic re-starts the phase failure/low voltage alarm condition remains, the alarm must be manually reset.

h. Corrosion Inhibiting Modules

Corrosion inhibiting modules shall be installed in all electrical enclosures in accordance with the manufacturer's recommendations.

3. Control Sequence:

As shown on the Plans and if applicable, as detailed in Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment."

4. Alarm Features

a. "HIGH LEVEL" Alarm Light:

(1) Weatherproof cast steel fixture, with red globe and guard mounted on top of control panel. See "ATTACHMENT" for recommended manufacturer and model.

(2) Include panel door mounted red push-to-test indicator light and a reset pushbutton.

(3) Include connections from float mentioned in Paragraph 2.02 D.1.b for "HIGH LEVEL" Alarm and pump status - "ON"/"OFF" to be able to be transmitted to the customer operated control panel or PLC and/or the Owner's Supervisory Control and Data Acquisition (SCADA) system. See Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment" for more information on the interface between the pump and the Owner's SCADA system, if applicable.

5. Accessory Features

a. Condensation Protection:

Heater and adjustable thermostat control, panel powered.

b. Lighting Panel:

Transformer, when required, and circuit breakers as indicated on the Plans.

D. Level System

1. General

a. Function:

Actuate contact at preset liquid level

b. Type:

Direct-acting float with an enclosed non-mercury switch and integral cable sized to extend from pump to Control Panel.

c. Float to be non-immersible, tear-drop shaped, polyurethane buoyancy element suspended by reinforced cables.

d. Switch to be Single-Pole-Single-Throw - "NORMAL-OPEN" (SPST N.O.) in vertical position, 12 amp, 115 V AC, encapsulated within float, tilting bulb, non-mercury switch. Switch to close when in horizontal position to start or stop pump.

2. Service

a. Liquid: Water sample analyzer waste

b. Pressure: Atmospheric

c. Temperature: 0 to 50° C

d. pH: 5 to 9

3. Cable Support:

Fasten to weighted chain or vertical rod located in a position to facilitate removal of float switches without entering basin. Use polyethylene or stainless steel chain or AISI type 304 stainless steel rod. All materials to be corrosion-proof in wet-dry wet well conditions.

E. Wet Well Basin

1. Size:

See "ATTACHMENT" for recommended sizing of sanitary sewer lift station.

2. Wet Well Basin shall be one piece unit manufactured to meet or exceed all applicable ASTM specifications and suitable for sanitary service.

3. Basin shall be made from either high density polyethylene, injection molded polyethylene structural foam, or fiberglass reinforced polyester resin and water tight. Material shall be inert and acceptable to the environment, and pH range 5-9.

4. The inner surface of fiberglass tanks shall be smooth and resin rich, free of cracks, exposed fibers, porosity, and crazing.

5. The tank wall thickness shall be such as to provide necessary strength to meet tensile and flexural physical properties and to withstand collapse or buckling based on soil loads and hydrostatic pressure.

6. Wet Well Basin bottom shall withstand hydrostatic uplift pressure, with center deflection of empty basin less than 3/8 inch deflection, and not interfere with pump mounting requirements.

7. Wet Well Basin shall be designed to counteract buoyancy forces assuming flooded conditions (i.e. complete submergence) of empty basin.

8. Floor of Wet Well basin is to be mounted on a concrete slab and bolted to prevent floatation of empty wet well under a flooded condition at finished grade.

9. Top of Wet Well basin shall be a minimum of 6 inches above finished grade.

10. Wet Well basin shall be vented to atmospheric pressure.

11. Include provisions for a weatherproof vent with 16 mesh stainless steel bug screen, sized for 3 times the pump capacity indicated in the "ATTACHMENT."

12. Include piping and electrical stub-outs through roof and walls as indicated in the Plans.

13. Access Cover:

    a. Cover shall be solid of same structural material as basin with outlet allowances for vent, discharge, electrical conduits, bolts, and seals. Cover shall be bolted to basin to provide a good seal.

2.03 FABRICATION (NOT USED)

2.04 SOURCE QUALITY CONTROL

A. Factory Test

1. Test each size pump at factory in accordance with Hydraulic Institute Standards using a prototype, unless otherwise designated.

PART 3 EXECUTION

3.01 - 3.02 (NOT USED)

3.03 ERECTION, INSTALLATION APPLICATON AND/OR CONSTRUCTION

A. Install this item and its accessories as per manufacturer's printed instructions, Shop Drawings, and recommendations. Adjust free length of power cable to minimize movement with pump in place.

3.04 REPAIR/RESTORATION (NOT USED)

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Services

1. Prior to installation, check each unit for insulation breaks or moisture, run unit dry, and check for rotation.

2. Manually trip level sensors and check complete cycle of control operation.

3. Run unit submerged for not less than 10 minutes.

4. Furnish services of manufacturer's technical representative to check installation, witness field testing, assist in making adjustments, and instruct operators in maintenance and operation procedures.

3.06 - 3.10 (NOT USED)

END OF SECTION

ATTACHMENT

[Design Engineer is to complete blanks per site requirements]

1. Acceptable Manufacturers:
2. Recommended Manufacturer/Model:
3. Number of Units:
4. Rated Capacity:
5. Total Dynamic Head:
6. Pump Service:
7. Pump Discharge Size:
8. Solids Handling Size:
9. Discharge Line from Wet Well:
10. Motor Characteristics:
11. Voltage:
12. Wet Well Basin Size:
13. "HIGH LEVEL" Alarm Light:

END OF SECTION