

**SECTION 11310 WASTEWATER PUMPS****PART 1 GENERAL****1.1 SUMMARY**

- A. The supplier shall furnish three submersible pumps complete with all appurtenances, accessories and spare parts as will be required to produce a complete and workable installation. Pump bases and slide rails systems shall be provided.

**1.2 SUBMITTALS**

- A. Submittals shall be provided showing Total Dynamic Head, Pump Efficiency, Brake Horsepower, Power Input to Electric Drive Motor of Pumping Unit for the various conditions under which the units are to operate along with descriptive data and specifications describing in detail the construction of the complete units. Shop drawings shall be provided showing all weights and dimensions necessary for the installation of foundations, anchor bolts, piping and valve connections.
- B. The manufacturer shall have a minimum of five installations of the exact combination of pump and motor model proposed to be furnished for this project. Installations must be in operation for a minimum of five years and shall list the pump model, motor model and horsepower, date of installation, duty point, and contact information including telephone number.
- C. Operating and Maintenance Manuals: Provide minimum 1 digital copy and 2 printed copies complete operation and maintenance manuals, lubrication recommendations and other written recommendations for operation of the equipment.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pumps, pipe, pipe fittings, access hatches, lifting hoist, and seals from dirt and damage.

**PART 2 PRODUCTS****2.1 SUBMERSIBLE WASTEWATER PUMPS**

- A. The sewage pumping units shall be vertical, non-clogging, centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be direct driven by integral squirrel cage, electric induction motors. Each pump shall include motor, bearings, quick removal system, anchor bolts and all accessories specified herein.
- B. Pumps shall be of the models listed below or pre-approved equal. Requests for consideration as approved equipment must be received by the Engineer at least 5 days prior to the date for receipt of bids. Requests should include sufficient information for consideration including, but not limited to, pump curves, dimensional drawings, material specifications, motor information, manufacturer information, deviations (if any) from the specifications, and a list of references. Engineer's decision of approval or disapproval of a proposed item will be final.
  - 1. Flygt N Series
  - 2. Wilo FA Series

3. Fairbanks Morse 6" Series
- C. Pumps shall meet the performance and material specifications of the section. Pumps specifically listed as approved are not exempt from this requirement. The pump manufacturer shall certify and guarantee that the proposed pumps will meet the performance and material requirements as specified. Proposed deviations from the specifications shall be submitted to the Engineer at least 5 days prior to the date for receipt of bids for consideration. Only deviations noted as acceptable in writing from the Engineer will be allowed. Deviations without such written acceptance may be cause for rejection, even for a pump model listed in the specifications.
- D. Pumps shall conform to the following requirements:
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| 1. Number of Pump Units:                                 | 3  |
| 2. Primary Duty Point Flow (gallons per minute):         | 1,600 GPM  |
| 3. Total Dynamic Head at Primary Rating Point (T.D.H):   | 193 feet TDH   |
| 4. Minimum Hydraulic Efficiency at Primary Rating Point: | 65 %   |
| 5. Maximum NPSHr:  | 15 feet  |
| 6. Minimum Motor HP:                                     | 120 HP (non-overloading to >2,600 gpm on pump curve) |
| 7. Motor Voltage:  | 480 Volt, 3 Phase Delta                              |
| 8. Discharge Outlet Size:                                | Min. 6"  |
| 9. Minimum Solids Passage:                               | 3 inch   |
| 10. Minimum Cable Length:                                | 50 feet  |
| 11. Wetwell Height:                                      | 24 feet  |
- E. Volute: The volute casing shall be constructed of a single piece of ASTM A48 minimum Class 35B cast iron, non-concentric design with centerline discharge capable of prolonged resistance to raw sewage. Passages shall be smooth and of sufficient size to pass any solids which may enter the impeller. Suction and discharge flanges shall be 125# and meet ANSI standard B16.1. All nuts, bolts, washers, and other fastening devices supplied with the pumps shall be stainless steel. All mating surfaces requiring a watertight seal shall be machined and fitted with Buna-n O-rings.
- F. Impeller: Pump impellers shall be of the solids handling non-clog type. The impeller shall be dynamically balanced to provide smooth vibration free performance. The impeller vane shall be smooth, finished throughout, and shall be free from sharp edges. Pump impellers shall be manufactured from ASTM A48 Class 35B cast iron. Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation. The impeller shall be capable of passing a three inch solid non-deformable sphere.
- G. Wear Rings: Pumps using enclosed impellers shall be provided with stainless steel casing wear rings.
- H. Submersible Motors:
1. Each pump shall be furnished with a squirrel cage, induction motor enclosed in a watertight housing suitable for use and compatible with variable frequency drive systems.
  2. The motor shall be suitable for dry pit or wet pit installation under full load conditions. Motors shall be certified for variable frequency drive systems without de-rating the motor output power. The

motors shall have interior cooling and be capable of installation in either the wet pit or dry pit installation without adding or removing any items to the motor's exterior.

3. The motor and pump shall be designed and produced by the same manufacturer.
  4. The motors shall have moisture resistant NEMA Class F or H insulation and Class H slot liners and constructed to NEMA B design standards. The copper wound stator shall be constructed to withstand a temperature of 180 degrees Centigrade as defined in NEMA Standard MG-1. The stator shall be press/heat-shrink fitted into the stator housing. The use of bolts, pins, cable ties, or other fastening devices to restrain windings shall not be allowed. The rotor shall be statically and dynamically balanced after fabrication. The rotor shall utilize aluminum bars and short circuit rings. The constructed motor shall be certified for continuous duty with a service factor of 1.15 and shall be non-overloading over the entire range of the impeller unless specifically excepted by the Engineer.
  5. Motors shall be capable of sustaining 15 starts per hour (unlimited starts with VFD) at a minimum ambient temperature of 40°C.
  6. Motors shall have a voltage tolerance of +/- 10%.
  7. The power cables entering the motor housing shall connect to individual terminal pins, which separates the incoming service from the pump motor.
  8. Thermal switches shall be furnished to monitor stator temperatures. The stator shall be equipped with thermal switches, embedded in the end coils of the stator. Thermal switches shall connected to the control panel and shall automatically de-energize the motor when its temperature exceeds a preset limit as recommended by the manufacturer.
  9. The pump manufacturer's nameplates shall be engraved or stamped on stainless steel and fastened to the motor casing with stainless steel screws or drive pins.
- I. Shafts: Pump shafts shall be AISI 420 (1.4021) stainless steel. The shaft shall be one piece construction without joints or stubs attached. Multiple row lower bearings and a single row upper bearing support the motor/pump shafts. Bearings shall be sized to provide a minimum L-10 life of 50,000 hours anywhere on the flow versus head curve. Thrust bearings shall be restrained from thrust in both directions.
- All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection.
- J. Mechanical Seals: Each pump shall be provided with a dual tandem mechanical shaft seal system consisting of at least two seal sets. Both upper and lower seal faces shall be silicon carbide versus silicon carbide or tungsten carbide versus tungsten carbide. Each seal interface shall be held in place by its own spring system. The seals shall not depend on the direction of rotation for sealing. The seal system shall not rely on the pumping medium for lubrication.
- Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The lubricant chamber shall include one drain and one inspection plug accessible from the exterior of the motor.
- A seal failure sensor/switch shall be provided in a chamber between the upper and lower seals. This sensor shall be wired to the Pump Control Panel and shall activate an alarm light upon seal failure.
- K. Power and Control Cables: Power and control cables shall be furnished in lengths to run unspliced from the pump to the pump control panel. Cables shall terminate with conductor sleeves that bundle the entire group of strands of each phase to improve termination at the pump control panel. The sleeves shall be

provided to confirm that all strands of each conductor is terminated properly. Termination shall be coordinated with the connection to the Pump Control Panel.

Cables shall conform to industry standards for loads, resistance under submersion against sewage, and be of stranded construction. The outer jacket of the cables shall be oil, water, and UV resistant and shall be capable of continuous submerged operation to a depth of 65 feet.

The cables for each pump shall pass through a cap with a strain relief component and then through a series of stainless steel disks and elastomer grommet that is sandwiched between the disks to control compression of the grommet. These components shall work to compress the cable jacket by the inner diameter of the grommet while the outer diameter of the grommet seals against the inside surface of the cable entry chamber in the top of the motor. The cable entry chamber shall be isolated and sealed from the motor.

- L. Removal System: The removal system shall consist of a discharge base elbow that mounts in the bottom of the wet pit, a replaceable pump coupling, rigid guide pipes and supports and hardware as required for a complete and operational system. The pump shall include a self-aligning guide bracket such that the pump can be removed and reinstalled without the need for personnel to enter the wetwell. Connections to piping shall be standard ANSI flanges.

The ASTM A48 Class 30B or higher cast iron discharge base elbow shall be provided to support the full weight of the submersible pump in the installation and provide a leak proof connection in which the pump coupling mates with the flange and is held in place by the combined weight of the pump and motor. No portion of the pump shall bear directly on the sump floor. The discharge base elbow shall be provided with guide pipe retention lugs.

Guide rails constructed of 304 stainless steel and supported by upper and intermediate brackets of 316 stainless steel shall guide each pump. The guide rails shall consist of standard dimension schedule 40 piping with a minimum diameter of 1-1/4" and a maximum diameter of 4". The guide rails shall be supported by a 316 upper guide rail bracket that will be mounted in the opening of the access cover to support and guide the pump/motor into and out of the wet well. Intermediate guide rail brackets shall be provided.

Each pump shall be supplied with a lifting chain of 316 Stainless Steel, rated for minimum 2.5 times the installed pump and coupling weight. The manufacturer shall provide information on recommended testing parameters that shall keep the lifting system capable of service for the life of the station. Recommendations shall be in written form and shall be discussed during startup training for the installation.

- M. Shop Painting: Shop apply to all exterior ferrous surfaces of the pump and motor with primer and finish coat. Shop apply to exterior and interior surfaces of elbow. Coating shall be Solvent-free ceramic coating, impregnated with aluminum oxides.
- N. Relays: Supplier of new pumps shall provide over-temperature and seal monitoring relays as recommended for to ensure proper operation with pumps.

### **PART 3 EXECUTION**

#### **3.1 WARRANTY**

- A. Warranty: The pumps and motors will be covered by a five (5) year warranty that shall comprise the following terms: The initial year from start-up of the equipment shall be covered 100% for parts and labor. The following years 2 through 5 may be prorated. This warranty shall not be limited by hours of running time or operation from variable speed drives.

### 3.2 START-UP SERVICES

- A. Field Service: The services of a factory trained field service technician shall be provided to inspect the completed installation, make all adjustment necessary to place the system in satisfactory operation and instruct the operating personnel in the proper care and operation of the equipment.

The field tests shall determine the head, discharge flow and overall efficiency characteristics of each pumping unit and in addition, shall demonstrate that under all conditions of operation each unit:

- Has not been damaged by transportation or installation.
- Has been properly installed.
- Has no mechanical defect.
- Is in proper alignment.
- Has been properly connected.
- Is free of overheating of any parts.
- Is free of all-objectionable vibration and noise.
- Is free of overloading of any parts.

### 3.3 SPARE PARTS

- A. The manufacturer shall furnish one set of the following spare parts:
1. Impeller and casing wear rings, where applicable
  2. Mechanical seal or seal repair kit with all seal faces and o-rings
  3. Upper and Lower Bearings set
  4. O-Ring Set
- B. A written description of each spare part and the storage recommendation shall be provided.

END OF SECTION