

DEVELOPMENT STANDARDS

SECTION 11312

SUBMERSIBLE SEWAGE PUMPS AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Provide all equipment and services required to furnish and install the submersible sewage pumps as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Special requirements for materials and equipment are given in Section 01600.
- B. Painting is shown on the Drawings.
- C. Motors and electrical work are specified in Division 16.

1.03 REFERENCES

- A. Where referenced specifications (ASTM, ACI, PCI, etc.), are mentioned, these standards are deemed to be the minimum standard of quality of materials or methods to apply to this project.

1.04 SUBMITTALS

- A. Shop drawings, control drawings, and operation and maintenance instructions shall be submitted in accordance with Section 01300. Refer to Section 01600 for additional requirements.

1.05 QUALITY ASSURANCE

- A. The pump manufacturer shall have a minimum number of not less than 50 units of the type specified and required installed and in operation handling sewage for no less than 2 years in North America.

PART 2 PRODUCTS

2.01 PUMPS AND MOTORS

- A. The pumps shall be capable of handling raw, unscreened sewage. The design of the connection between the pumps and the discharge piping shall be such that the pumps will be automatically connected to the discharge piping when lowered into place. The pumps shall be easily removable for servicing or inspection, requiring no bolts, nuts or other fasteners to be removed for this purpose, or need for personnel to enter the wet well. The pumps shall be fitted with a stainless steel chain for each pump, of adequate strength and length to permit raising the pump for inspection and removal.

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B. Casing and Impeller

1. The stator casing, oil casing and impeller shall be of grey iron construction, with all parts coming in contact with sewage being protected by a coat of rubber-asphalt paint. All external bolts and nuts shall be of stainless steel. The wear ring between impeller and pump housing shall be of stainless steel or bronze with vitrile rubber O-ring or neoprene O-ring at the inlet of the pump. The impeller shall be of nonclog design, capable of passing solids, fibrous material, and heavy sludge, and constructed with long throughway with no acute turns.

C. Shaft Seal

1. Each pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of two separate lapped face seals, each consisting of one stationary and one rotating ring with each pair held in contact by a separate spring. The lower seal shall be tungsten-carbide on tungsten-carbide or silicon carbide on silicon carbide. The upper seal shall be either tungsten carbide, silicon carbide or tool steel on carbon. The compression spring shall be protected against exposure to the pumped liquid.
2. The pumped liquid shall be sealed from the oil reservoir by one face seal and the oil reservoir from the motor chamber by the other. The seals shall require neither maintenance nor adjustment, and shall be easily replaced.
3. Seal failure detection shall be provided and wired to an indicator light in the control panel.

D. Pump Mounting and Removal Facilities

1. A sliding guide bracket shall be an integral part of the pumping unit. The pump casing shall have a machined connection with yoke to connect with the cast iron discharge connection, which shall be bolted to the floor of the sump and so designed as to receive the pump connection without the need of any bolts or nuts.
2. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided to and wedging tightly against the discharge connection.
3. Guide rails and all accessories shall be non-sparking stainless steel.

E. Motors

1. Pump motor shall be housed in an oil or air-filled watertight casing and shall have Class F insulated windings which shall be moisture resistant. All 3 phase motors shall be dual voltage. Pump motors shall have cooling characteristics suitable to permit continuous operation in a totally, partially or nonsubmerged condition.
2. Motors shall not be overloaded under any condition of operation. Motor service factor shall not be used to prevent overloading. See Division 16 - Electrical for detailed motor specifications.

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3. Motors shall be furnished with extra hard usage flexible power cables, length as required. The cable entry into the motor housing shall be equipped with integral strain relief or an external strain relief device installed to prevent cable pullout.
4. Each submersible pump shall be equipped with a power cable of sufficient length to reach to the disconnect switch or control panel without splicing.
5. The pump/motor assembly shall be suitable for use in hazardous locations. The assembly shall be rated or certified for use in NEC Class 1, Group D, Division 1 hazardous locations.
6. Electrical equipment furnished and installed by Contractor/Developer shall be labeled for the specific arc flash hazard in accordance with the latest version of NFPA 70E, Standard for Electrical Safety in the Workplace.

F. Pump Warranty

1. The pump manufacturer shall warrant the pumps being supplied to the OWNER against defects in workmanship and materials for a period of 5 years under normal use, operation and service. In addition, the manufacturer shall replace certain parts which become defective through normal use and wear on a progressive schedule of cost for a period of 5 years. Parts included are the mechanical seal, impeller, pump housing, wear ring, and ball bearings. The warranty shall be in published form and apply to all similar units.

2.02 PUMP AND MOTOR CHARACTERISTICS

- A. The service conditions, size and characteristics of the pumps and motors shall be as shown in Table 1.

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1. Table 1 - Example - Pumping Station

Item	Unit	Quantity
Number of Units Required	--	_____
Minimum Static Head	Feet	_____
Average Static Head	Feet	_____
Maximum Static Head	Feet	_____
Capacity Requirement	gpm	_____
Total Head @ Capacity Required and Maximum Static Head	Feet	_____
Pump Efficiency @ Capacity Required	Percent	_____
Minimum Shutoff Head	Feet	_____
Minimum Discharge Size, Diameter	Inches	_____
Diameter of Solids Passed	Inches	_____
Maximum Motor Size	Hp	_____
Maximum Allowable Pump and Motor Speed	rpm	1800
Motor Phase	--	_____
Motor Voltage	V, ___	_____

2.03 ACCESS FRAME AND GUIDES

- A. A complete access frame and guides for each pump shall be furnished complete with hinged and hasp-equipped cover(s), stainless steel upper guide holder and level sensor cable holder. Frame shall be securely mounted above the pumps. Each door shall have safety locking handle in open position. Doors shall be of checkered aluminum plate, aluminum frame and all stainless steel hardware.
- B. Lower guide holders shall be an integral part of the discharge connection. Guide bars shall be of stainless steel pipe of the size indicated on Drawings or required by the pump manufacturer.

2.04 CONTROLS

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- A. The pumps shall be furnished with a control panel as specified in Division 16. The pumps shall operate by wet well level control system or by liquid level sensors. The lead pump will operate via variable frequency drives under normal conditions. Three sensors are required, three normally open for stop, start lead, and start lag. See the control circuit on the drawings and sequence of operation in Division 16 of these specifications for complete control requirements. The controls for the pumps shall be provided by the pump manufacturer.
- B. Each submersible pump shall be furnished with seal leak detection. Extra hard usage power cable shall also be furnished with each pump, and a power cable support/mounting bracket. All cables shall be of adequate length to remove pumps and set wet well pump control elevations as necessary.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. Store indoors.
- B. Pumps and motors shall not be stored on vibrating bases or floors. Any motor so stored should be disassembled and inspected for bearing damage, prior to service. If bearing damage is evident, replace bearing.
- C. Check the rust preventative coating on external machined surfaces (including shaft extension) for damage. If necessary, recoat the surfaces with Rust Veto No. 342 (Manufactured by E.F. Houghton Co.) or equivalent. The condition of the rust preventative coating shall be checked periodically and surfaces should be recoated as recommended by the coating manufacturer.
- D. Oil lubricated bearings - drain oil from bearing housing and refill, to maximum level, with a circulating type oil. Oil should be changed every 12 months while motor is in storage.
- E. Grease lubricated bearings - once a month, inject a small quantity of grease into the grease fill such that grease is purged from the drain. Inspect purged greases for water condensation or oxidation. If water condensation or oxidation is evident, the motor shall be disassembled and contaminated grease removed, and replaced with new grease.
- F. Take precautions as necessary to prevent rodents, snakes or other small animals from nesting inside pump.
- G. Prevent moisture or condensation from accumulating by energizing motor space heaters if provided, or applying reduced voltage to one phase of motor windings (trickle-voltage-heating). Request percent of rated voltage and transformer capacity to be used from manufacturer. The winding should be maintained 5°C minimum above ambient temperature (some locations require a higher temperature above ambient) to prevent condensation.
- H. If pump and motor are covered by plastic or similar material, additional precautions such as heated or circulating air and silica gel may be necessary, to protect against moisture or condensation.
- I. Rotate pump and motor shaft several revolutions by hand once every two weeks while in storage to insure a protective oil film on bearing surfaces.

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J. Start-up preparation after storage:

1. Thoroughly clean and inspect motor.
2. Change oil or grease in bearing housing.
3. Secure all plugs, fittings, etc., to prevent leakage.
4. Check insulation resistance.

3.02 INSTALLATION

- A. Submersible pumps shall be shipped to the job completely assembled with the power cable attached. The unit must be properly stored and special care given to the protection of the power cable to protect it from mechanical damage and protect the cut end of the cable from the intrusion of moisture. The cable will act like a wick if the cut is allowed to lay in a pool of water. Should this condition be allowed to occur, the unit shall be shipped back to the manufacturer for complete drying out and testing. A test report from the manufacturer shall be required before any payment for unit is made.
- B. It is important that the discharge connection is attached to the bottom slab level and at the exact location required relative to the access cover. Suggested procedure:
1. Install access cover.
 2. Attach upper guide bracket(s).
 3. Put discharge connection(s) on bottom slab.
 4. Cut to length and install guide bars between upper guide bracket(s) and discharge connection(s).
 5. Check with level (shim, if necessary) and anchor discharge connection(s) exactly where position will result in guide bars being parallel and vertical.
- C. Use proper gaskets, tighten SS bolts gradually and evenly. In deep stations install discharge pipe brackets to relieve discharge connections from overload and intermediate guide bar brackets to prevent guide bars from bending when pumps are pulled.
- D. Lower pump units into place along guide bars. Check visually metal-to-metal contact between volute flange and discharge connection. If necessary, re-check and re-align discharge connection(s) and guide bars with pumps in place.
- E. After proper alignment of all components, including metal-to-metal connection of pump flange is established, grout access cover, discharge connection(s) and pipe thrulets. Build up and shape slopes at pump bottom in accordance with Drawings.
- F. As a part of the final inspection each pump shall be pulled to verify trueness of alignment of guide rails, in the presence of the OWNER and the ENGINEER.
- G. All motors and controls shall be connected and the motor operated while disconnected from the pump to determine proper rotation and to observe for vibration or motor defects. Disconnecting of the pump and motor on certain factory assembled units may be waived by the ENGINEER.

3.03 TESTING OF PUMPS

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- A. All pumps shall be tested to verify performance data submitted. When possible, pumps shall be tested by pumping down a basin or by filling a basin. All pumps shall be tested for capacity at a minimum of 3 points on the pump curve. The motor full load amperage and voltage shall be checked and must fall within the rated values of the motor tested. Failure to perform can result in having the unit removed and replaced.
- B. All tests shall be performed by the CONTRACTOR in the presence of Richmond Utilities. All equipment needed for the pump tests, rulers, stopwatch, gauges, volt meter and ammeter shall be provided by the CONTRACTOR.
- C. All motors shall be megged with the winding resistance recorded. Motor voltage and amperage shall also be measured and recorded.
- D. All test data shall be reported to Richmond Utilities in writing.

3.04 SPARE PARTS

- A. Spare parts shall be furnished for all pumping equipment. All spare parts shall be boxed and tagged with positive identification, including part number, description and the particular pump to which it applies.
- B. The required spare parts shall include the following items as a minimum for each different size or model pumping unit:

One complete set of mechanical seals

One set of impeller adjustment washers

One set of O-rings

Wear ring

Impeller screw

END OF SECTION

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