

SECTION 22 14 29

SUMP PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sump pumps.
- B. Motor (for submersible pump).
- C. Controls.
- D. Guide rails and lifting cables.
- E. Portable hoist.
- F. Oil absorbents.

1.02 MEASUREMENT AND PAYMENT

- A. General: Sump pumps will not be measured separately for payment but will be paid for as part of the Contract lump-sum price for Mechanical Work as indicated in the Bid Schedule of the Bid Form.

1.03 REFERENCES

- A. California Plumbing Code
- B. NEMA

1.04 REGULATORY REQUIREMENTS

- A. Refer to Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC, Section 20 60 13 – Motors for Facility Services, and Section 20 70 26 – Common Materials and Methods for Electronic Services, for requirements.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Submit manufacturers' product data for the equipment, defining size and arrangement, and for related materials, appurtenances, and installation accessories. Submit Shop Drawings and details, installation instructions, wiring diagrams, assembly and other items required for a coordinated installation.

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- C. Submit certified copies of factory test reports, including manufacturer's certified performance and efficiency curve data for sump pumps.
- D. Submit maintenance and operating data in accordance with Section 01 78 23 - Operation and Maintenance Data. Include detailed parts lists, lists of recommended spare parts, lubrication and maintenance procedures, troubleshooting procedures, and operating instructions.

1.06 QUALITY ASSURANCE

- A. Pump manufacturer shall be a company or firm who has been regularly engaged in the manufacture of sump pumps of similar type and size, and has a history of at least five successful similar installations in operation for at least three years, without excessive maintenance or repair.
- B. Sump pumps and their installation shall comply with the requirements of the California Plumbing Code, Chapters 7 and 8, as applicable.
- C. Pumps shall not overload at any point on the performance curve. Indicated capacity shall be at midpoint of performance curve and at maximum efficiency region of the efficiency curves.

1.07 SITE CONDITIONS

- A. Inspect the conditions of the area where products are to be placed or installed before the work of this Section begins. Provide surfaces and structures capable of supporting the products. Electrical products that serve the equipment shall have been installed, tested, and accepted before pump equipment is started and operated.

PART 2 - PRODUCTS

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- A. Pump Type and Design:
 - 1. Provide non-clogging, automatic, electric-motor driven, submersible, column, close coupled, dry pit, chopper, grinder, centrifugal duplex type pump as indicated.
 - 2. Each pump shall have a pumping capacity as indicated, but not less than 50 gallons per minute against the minimum, total dynamic head (TDH), system curve indicated when pumping water at 65 degrees F with a specific gravity of 1.04 and containing less than ten percent solids up to 2 inches in diameter at a maximum speed of 1750 RPM. Each pump shall operate at or near its best efficiency point when operating at the average TDH system curve. Each pump shall have the impeller sized such that the developed pump horsepower is no more than 95% of its nameplate horsepower at nameplate voltage and speed conditions anywhere within the normal operation range of the pump.
 - 3. Pumps shall be capable of running dry without damage to the motor or pump.
 - 4. Pumps shall be capable of handling wastewater continuously, 24 hours per day, with regular scheduled maintenance.
 - 5. Provide submersible pumps with a cast iron fixed discharge elbow and removable pump/motor unit with guide rail disconnect system fabricated from type 316 stainless

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steel. The guide rail disconnect system in conjunction with portable hoist system with type 316 stainless steel cable and hardware, shall permit easy removal of each pumping unit for inspection or service without requiring personnel to enter sump. Fixed discharge elbow shall be anchored to pit floor using type 316 stainless steel epoxy anchors and hardware. Simple expansion anchors are not acceptable.

6. Submersible pumps, when lowered into place, shall be automatically connected to the discharge piping. There shall be no need for personnel to enter the wet well to inspect or service the pumps. Provide a portable hoist system capable of lifting or lowering the pump between the wet well and pump access floor.
7. Chopper or grinder pumps shall be capable of cutting and/or chopping wood, rags, plastics, and other miscellaneous materials.
8. Volute casing, motor enclosure and discharge shall be cast iron.

B. Impeller:

1. Impeller shall be a cast-iron non-clog design, in a natural hydraulic balance and capable of passing solids, fibrous material, and heavy sludge. Provide impeller with long-throughway having no acute turns.
2. Impeller shall be fastened and locked to the shaft to preclude material movement and to prevent loosening by reverse rotation.

C. Shaft:

1. Provide Type 316 stainless steel pump shaft or shaft bushing capable of maximum bearing and seal life with minimum deflection.
2. Shaft shall not distort under maximum operating conditions.

D. Bearings:

1. Pump shall be designed so that axial and radial loads are transferred to the motor bearings.
2. Bearings shall be designed for a minimum of 25,000 hours B-10 life of continuous operation under the specified conditions.
3. Provide sealed, antifriction, pre-lubricated bearings with a design lubricant quantity equivalent to not less than 50,000 hours of continuous operation.

E. Seals:

1. Provide pump with easily replaceable tandem mechanical seal. Seal faces shall run in an oil reservoir.
2. Equip tandem seals with lower seal consisting of one stationary and one rotating tungsten-carbide ring, and upper seal consisting of one stationary tungsten-carbide ring and one rotating carbon ring. Each pair shall be in contact by a separate spring.

2.02 MOTOR (FOR SUBMERSIBLE PUMP)

- A. Refer to Section 20 60 13 - Motors for Facility Services, for general requirements.
- B. Enclose motor in an air-filled, watertight casing with Class F, moisture-resistant insulated windings, and NEMA 1 Design, B rated at a temperature not more than 155 degrees C.
- C. Provide a motor with cooling characteristics that will permit continuous operation in a totally submerged, partially submerged, and non-submerged condition.
- D. Separate cable junction box and motor, by either a stator-lead sealing gland or terminal board, in a manner that will isolate motor from water and solids gaining access through pump top.
- E. Provide a moisture detector mounted at a low point in the motor housing with control box to interface with motor controls or alarms.
- F. Provide motor lead and float switch cables of sufficient size length and sheathing for the required service.
- G. For column and dry pit, provide close-coupled open drip-proof, non-overloading electric motor. Provide conduit box attached to motor.
- H. The power for the sump pump motors shall be provided by feeding from two separate and distinct utility substations.
- I. All sump pump motors shall be equipped with a weatherproof device consisting of a combination twist-lock plug and receptacle. The receptacle shall have a threaded cap with a liquid-tight seal to eliminate access to live parts when the motor plug is not connected. The sump pump motor thermal and moisture sensors shall be provided with a separate weatherproof twist-locked type plug and receptacle device. These devices shall be NEMA 4X, UL listed and comply with the requirements of NEC on Motors, Motor Circuits and Controllers Disconnecting Means.

2.03 CONTROLS

- A. Pump controls shall be duplex alternator, Warrick Controls Inc., Series 67, a District designated matching product (DMP). Pump controls shall be enclosed in a NEMA 4 enclosure complete with main disconnect/circuit breaker and alternator designed to operate on 480 V, three phase, 60 Hz power supply. Provide for each pump motor, a circuit breaker, starter having three phase overload protection with manual reset, magnetic contactors, and a hand-off-automatic selector switch. Provide control circuit transformer with disconnect and overload protection, and automatic electrical alternator. All disconnect switches shall be accessible from outside the control panel, liquid level controls, and control circuit transformer shall be wired on the main disconnect side of the switch. The main circuit breaker disconnect switch shall be accessible from exterior of panel.
- B. Level Controls shall be District Designated Matching Product (DMP), Warrick Wire suspended probe Type, part number 3W3, with PVC housing, and 316 stainless steel probe.

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- C. Controls shall permit alternate operation of duplex pumps, and shall be set to activate one pump when the sump water level rises to the first preset pump start level, to activate the second pump while the first pump remains in operation when the sump water level rises to a second preset level, and to continue operation of both pumps and activate an alarm when the sump water level rises to a third preset level. Both pumps shall shut down automatically when the sump water level is down to the duplex pump stop level. The height of the first preset water level shall be at least 6 inches above the pump intake and a 6 inch minimum separation between each pump level.
- D. Controls shall permit continuous operation of simplex pumps, and shall be set to activate pump when the sump water level rises to the preset pump level start level. The pump shall shut down automatically when the sump water level is down to the pump stop level (6 inches minimum below the first preset pump start level).
- E. Provide a set of dry contacts for local and remote monitoring indicating high water level alarm, motor thermal sensor, moisture detection and pump failure alarm. An alternator for duplex or triplex units shall be provided.
- F. Provide motor starters, overload and disconnect function as specified under Division 20, Facility Services, Division 26, Electrical, and Division 33, Utilities.
- G. Precalibrate control unit to match motor characteristics and factory seal to ensure trip setting is tamperproof. Wire pump controls to terminal strips for connection to external wiring.
- H. For small simplex pumps provide liquid-level sensors, each consisting of a water proof switch in a smooth, pear-shaped, chemical-resistant, polypropylene casing suspended on its own cable.
- I. Provide time delay on motor starting so that, during power failure, when power is restored, both pumps will not start simultaneously and trip out.
- J. Provide high water alarm low, voltage alarm, and moisture detector alarm.
- K. All pumps shall be equipped with non-resettable hour-cycle meters. All submersible pumps shall be equipped with moisture sensors and alarms.
- L. All pumps shall be equipped with a time delay relay set at 30 minutes (unless otherwise directed by the Engineer) that will send a signal to Operations Control Center (OCC) if one of the pumps runs continuously over 30 minutes.
- M. The following level arrangements shall be used for the associated pump configurations:
 - 1. Duplex pump stations – a low level all pumps off, followed by a primary pump on, a secondary pump on, and a high level alarm.
 - 2. High volume triplex pump stations – a low level all pumps off, followed by the primary pump on, secondary pump on, and the third pump on with high-level alarm.

2.04 GUIDE RAILS AND LIFTING CABLES

- A. Provide guide rails, stainless steel, Type 316, pipe and mounting brackets as required, for a complete package ready for installation.
- B. Provide pump centerline connected guides to allow ease of up-down movement of pump in guide rails.
- C. Provide a stainless steel, Type 316, lifting chain with a clevis at each end (hooks shall not be used) for securing to the pump and to eyes at sump cover level. Provide a chain sufficiently long to ensure proper seating of the pump discharge assembly connection, using a safety factor of five applied to the pump/motor assembly, and without interfering with normal pump operation.
- D. Unless otherwise indicated, provide a heavy-duty galvanized steel, aluminum or cast-iron construction cover with removable hatch of adequate size to allow unrestricted removal of the pump through the opening.

2.05 PORTABLE HOIST

- A. Provide a portable hoist system capable of lifting and lowering the pump between the wet well and pump room floor as indicated. Hoist shall be equipped with stainless steel wire cable of at least 1.5 times the depth of the sump. Hoist shall be rated at 125 percent of design load and capable of rotating that load 360 degrees.
- B. The portable hoist system shall be a complete assembly that can be easily removed, transported and used at various locations as indicated.
- C. Each sump pump shall be provided with a floor-mounted steel holder (socket-type) at the pump room floor to support the portable hoist. The holder shall be painted "yellow".

2.06 OIL ABSORBENTS

- A. Provide two oil absorbents per sump as indicated. The oil absorbents shall be a pillow type, dimensions of 18 inches by 22 inches by 3 inches or equal. Absorbent material shall be shredded polypropylene foam type suitable for holding oil while repelling water.
- B. Oil absorbent pillows shall have a grommet attached so they can be tethered. Each absorbent pillow shall be tied to a rope that shall be fastened to a hook near the access hatch. The rope shall be a twisted polypropylene rope, yellow in color, 3/16-inch diameter, and of length sufficient to allow free floating even at lowest water level.

2.07 DISCHARGE PIPING

- A. Refer to Section 20 10 13 – Common Materials and Methods for Facility Services for general piping requirements.
- B. Discharge piping shall be sized such that the discharge velocity does not exceed 10 feet per second.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install, align, connect, and test the equipment in accordance with the pump manufacturer's installation instructions and recommendations.
- B. Place pump unit in a sump as indicated.
- C. Provide electrical connections required for proper pump operation.
- D. Provide check valve, gate valve, and union in discharge from pumps above level of sump.
- E. Make adjustments required to place system in proper operating condition in accordance with the manufacturer's instructions and recommendations.
- F. Remove foreign material, dirt, and debris from sump and pump system.

3.02 TRAINING

- A. Refer to Section 01 79 00 - Demonstration and Training, for training of BART maintenance personnel requirements.

3.03 FIELD TESTS

- A. Perform field test for each sump pump installation with the Engineer present to witness the tests. Provide all necessary instruments, test setup, test water connections, labor and tools for testing. Test water shall be made available from point(s) designated by the Engineer. Defective workmanship, materials and equipment shall be corrected or replaced in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer at no cost to the District. All corrected work shall be retested to ensure compliance with these Specifications.
- B. Prior to testing, submit to the Engineer for approval, test procedure along with manufacturer's recommendations for startup and test.
- C. For test purposes, normal sump discharge shall be bypassed and, where possible test water shall be recycled.
- D. Field test shall demonstrate work quality, operation, and performance. Each test attribute shall be completed in the order listed below to the satisfaction of the Engineer. Submit a written record indicating that the items listed have been completed.
 - 1. Measure the length and width of sump, and measure any incoming drainage water. Add test water from water source. Start lead pump, automatically, at designated sump level, and allow to pump down to stop level.
 - 2. Start alternate lead pump, automatically, at designated sump level, and allow to pump down to stop level.
 - 3. Start lead pump, automatically, at designated sump level, and allow to pump down to stop level (proving alternative system).

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4. Start lag pump, automatically, at designated sump level, and allow to pump down to stop level (proving alternative system).
5. Shut-off pumps. Add water until high water automatic alarm at designated sump level is activated. Check that alarm is received by Central. Turn pumps on simultaneously and allow to pump down to stop level.
6. Add water for pumps (lead/lag) to allow regular operation for a period long enough to test circuit heaters (over loads) and to confirm clean discharge to the downstream sump or to the satisfaction of the Engineer.
7. Run each pump for 6 minutes and record ampacity and discharge pressure.
8. Perform draw down test on each pump and record the drop in water level over a five-minute period. Calculate the cubic feet of water pumped, add in any incoming water drainage, and convert to gpm.
9. Demonstrate operability of moisture alarm.

3.04 CLEANING

- A. Clean exposed sump pump parts and surfaces with clean cloths.

END OF SECTION 22 14 29