

SECTION 11261
PUMP, PUMP DRIVE MOTOR AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install and test, and make ready for operation three (3) angled line shaft, single stage axial flow impeller pumps, motors and controls as specified herein.
- B. All necessary and desirable equipment whether specifically mentioned in this Section or not shall be furnished and installed as required for an installation incorporating the highest standards for this type of service.

1.2 RELATED WORK

- A. Electrical work as specified herein and in Section 16000.
- B. Instrumentation and control work as specified herein and in Section 16000.

1.3 SUBMITTALS

- A. Submit shop/design drawings and product data. Shop/design drawings must be approved by the Engineer prior to installation of motors and ancillary equipment. Submittals shall include the following:
 - 1. Certified by the Manufacturer, dimensional drawings of each item of equipment and auxiliary apparatus to be furnished.
 - 2. Schematic electrical wiring diagram and other data as required for complete pump installation and operation.
 - 3. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction, to indicate full conformance with the detail specifications.
 - 4. Submit evidence of a removable line shaft bearing/bronze bushings system to enable economical future maintenance.
- B. Test Reports
 - 1. Certified motor test data. Tabulated data for the drive motors including rated Hp, full load rpm, power factor and efficiency curves at 1/2, 3/4 and full load, service factor and kW input, including when the pump is at its design point.
 - 2. Pump performance curves. Certified rating curves to show pump characteristics of discharge, anticipated field head, brake horsepower, bowl efficiency and guaranteed net positive suction head required (NPSHR). Curves shall show the full recommended range of performance and include shut-off head. This information shall be prepared specifically for the refurbished pump.

C. Operation and Maintenance Data

1. Complete operating and maintenance instructions shall be furnished for all equipment. The maintenance instructions shall include troubleshooting data and full preventative maintenance schedules and complete replacement parts lists with ordering information.

1.4 REFERENCE STANDARDS

A. Design, manufacturing and assembly of elements of the equipment specified herein shall be in accordance with, the following:

1. American National Standards Institute (ANSI)
2. American Society for Testing Materials (ASTM)
3. American Bearing Manufacturers Association (ABMA)
4. Institute of Electrical and Electronics Engineers (IEEE)
5. National Electrical Code (NEC)
6. National Electrical Manufacturers Association (NEMA)
7. Occupational Safety and Health Administration (OSHA)
8. Society for Protective Coatings (SSPC)
9. Underwriters Laboratories (UL)

1.5 QUALITY ASSURANCE

- A. The Contractor shall assume responsibility for the satisfactory installation and start-up of the entire pumping system including refurbishing pumps, motors and associated items, as specified. The person or persons responsible for carrying out the installation shall be a licensed Contractor in the State of Florida.
- B. The equipment specified herein is intended to be standard pumping equipment of proven ability as manufactured by concerns having extensive experience in the production of such equipment. Units specified herein shall be furnished by a single manufacturer. The equipment furnished shall be designed, constructed and installed to operate satisfactorily when installed.

1.6 DELIVERY STORAGE AND HANDLING

- A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.
- B. All equipment and parts must be properly protected against any damage during shipment. Store the equipment in accordance with manufacturer's recommendations.
- C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

1.7 MAINTENANCE

- A. All spare parts shall be properly protected for long periods of storage and packed in containers that are clearly identified with indelible markings as to contents.

1.8 WARRANTY

- A. Provide written warranty and guarantee for all equipment and work.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The pumps and motors shall be designed and built for 24-hour continuous service at any and all points within the required range of operation, without overheating, without cavitation and without excessive vibration or strain. All parts shall be designed and proportioned as to have liberal strength, stability and stiffness and to be especially constructed to meet the specified requirements.
- B. Each major piece of equipment shall be furnished with a stainless steel nameplate (with embossed data) securely mounted to the body of the equipment. As a minimum, the nameplate for the pumps shall include the manufacturer's name and model number, serial number, rated flow capacity and all other pertinent data. As a minimum, nameplates for motors shall include the manufacturer's name and model number, serial number, horsepower, speed, input voltage, amps, number of cycles and power and service factors.

2.2 CONDITIONS OF OPERATION

- A. The pumps must be able to be operated individually or operated simultaneously as installed.

2.3 PUMP REFURBISHMENT

- A. The following minimum specifications shall be adhered to for pump refurbishment:
 1. Check shaft for straightness
 2. Repair bearing and seal area on existing shaft with "Metco" metalizing or approved equal.
 3. Replace all bronze bearings
 4. Re-weld cracks throughout pump as required
 5. Repair and re-weld distributor blades on pump.
 6. Re-blade and re-balance impeller
 7. Replace Cutlass bearing
 8. Replace seals
 9. Replace all lubricants
 10. Supply new gaskets and hardware.
 11. Sandblast and epoxy coat pump inside and out.
 12. Pump to be sandblasted to a near white finish and epoxy coated with 8-10 mils of Sherman Williams Paint Dura Plate 235 or approved equal
 13. Submit impeller curve for completed repair
 14. Provide detailed list of all repairs and work completed

2.4 PUMP DRIVE MOTOR AND EQUIPMENT

- A. The motor shall be suitable for driving the pump continuously over the entire pumping range without overload or without operating in the service factor. The motor shall be furnished with thrust bearings having ample capacity to carry the full weight of all rotating parts and hydraulic forces developed by continuous pump operation.
- B. The electric motor shall be rated 200 HP at 1200 rpm with a 1.15 service factor with motor space heater and internal t-stat. The pump electric motor shall be rated 460 volts, 3-phase, 60 hertz. The pump electric motor shall have Totally Enclosed Fan Cooled (TEFC) hostile duty enclosures with stainless steel nameplates. The pump drive motor manufacturer shall be US Motors, Lincoln Electric or approved equal.
- C. The Contractor shall provide complete belt drives 4/8V sheaves, bushings and belts. A belt guard shall be included.
- D. The electric motor mount shall be of the heavy-duty adjustable type. It shall be designed to support the weight of the electric motor plus any loads imposed upon it by the belt drive, with an additional safety factor for medium shock loads.

The electric motor mount shall be mounted directly to the floor of the pump station. It shall be capable of varying the center distance of the electric motor in relation to the water pump by a minimum of four (4) inches for installation and take up of the drive belts. It shall utilize hinge type design with two (2) hardened steel pusher bolts to adjust the center distance, allow precision parallel alignment of the pump and motor centerlines and fine tune the tension of the drive belts.

- E. Belt drives shall be designed using 3VX, 5VX, 5V or 8V belt cross sections. The small sheave outside diameter shall not be less than the NEMA standard for general purpose electric motors. Sheaves shall be locked securely to shafts by "QD" type bushings and pump thrust load shall in no way be transmitted through the bushing or sheave to the thrust bearings. Belts and pulleys shall be protected by a fiberglass or sheet metal guard. Guards for electric motor driven pumps shall be mounted to the pump hood by three structural steel brackets.
- F. Rebuild three (3) SL450 1:1 ratio Amarillo gear drives, replace all bearings and seals. Clean and paint.
- G. Each piece of equipment in the pumping system including pump, support system and motor shall be prepared and shop-primed as specified per Manufacturer's recommendations or as otherwise specified. The shop primer shall be compatible with the finish paint.

2.5 CONTROL PANEL

- A. General: One (1) UL approved control panel shall be supplied for the pump station; containing all the electrical and mechanical equipment necessary to provide for the operation of designated number of electric pumps and motor operated gates. The panel shall be wall-mounted type and provide remote monitoring and control from a SCADA telemetry system. The pumps will be controlled by the remote SCADA telemetry panel as programmed by SJRWMD.

B. Operation Requirements:

1. The control panel shall consist of all of the power distribution and control components as indicated on the plans and shall include a main circuit breaker and a motor circuit protector and solid-state reduced voltage motor starter for each pump motor, and 15-ampere, 120-volt circuit breakers as required. Motor space heater power and control.
2. Construction and Materials: The control panel shall be NEMA 3R 316 stainless steel dead front construction with welded double locking hasps and dead front aluminum inner door, and oriented as shown on the Drawings. The control panel shall include thirty percent (30%) extra mounting space for additional equipment.
The enclosure shall allow a minimum 8 inches (8") of clear space above the main circuit breakers and 10 inches (10") below the motor starters for making wire terminations. The control panel enclosure shall have a minimum 6 inches (6") of clear space along each side with bracing to allow strapping of the incoming power feeder from the electric service.
3. Panel Exterior:
 - a. Panel shall have stainless steel heavy-duty key locking door handle and three-point latch.
 - b. All exterior mounted accessories shall be constructed of corrosion proof materials such as stainless steel or aluminum.
4. Panel Inner Door:
 - a. The inner aluminum door mounted on a continuous hinge, two pivot handles shall be furnished for protection against exposed wiring and shall have cutouts for access to all of the circuit breakers. The inner door shall include a restraining mechanism to fix the inner door in the open position. Mounted on the inner door will be pump run, ready and fault pilot lights, hand-off automatic switches, elapsed time meters and SSRV starter monitoring panels for each pump; gate open and close pilot lights and open-close-auto switches for each motor operated gate; a 20-ampere ground fault duplex receptacle, duplex receptacle breaker, pump control breakers, and power meter.
 - b. A permanently affixed 11 inch by 17 inch (minimum), laminated panel wiring schematic and pump data sheet shall be installed on the interior of the enclosure door. In addition, there shall be permanently affixed to the interior side of the exterior enclosure door both a nameplate and a 10" x 12" pocket for log sheet storage. The nameplate shall contain the voltage, phase, rated horsepower, speed, date of manufacture, pump and panel manufacturer's name, address, and telephone number, pump data, including impeller data, operating point and head, KW input, amps at the operating point and at least two (2) other points on the pump curve.
5. Panel Components:
 - a. Main and Branch Circuit Breakers: All circuit breakers shall be heavy-duty industrial service molded case breakers with amperage rating as required. All circuit breakers shall have an appropriate locking device to

- meet OSHA lockout and tag-out rules. Circuit breakers shall be thermo-magnetic as manufactured by Square D.
- b. The control relays shall be enclosed, eight-pin and/or eleven-pin plug-in type. The control relays shall contain test button and neon or LED energized indicator. The plug base shall be keyed to allow for proper pin alignment. Control relay sockets shall be octal-style with clamp on screw terminals. These sockets shall be mounted on DIN railing and 600 VAC rating. All relay sockets shall be keyed to allow for proper pin alignment. Relays shall be Eaton D3PF3 Series, or equal.
 - c. Duplex Service Receptacle: A duplex service receptacle supplying 20 amps at 115 volts shall be provided on the panel door. The duplex receptacle shall be provided with ground fault protection.
 - d. Elapsed Time Meters: Elapsed time meters shall be 115-volt non-reset types and shall indicate pump running time in hours and tenths of hours to 99999.9 hours.
6. Motor Starters:
- a. A solid-state reduced voltage, NEMA rated, motor starter as manufactured by Square-D (Altistart Model 48), shall be furnished for each pump motor. All motor starters shall be equipped to provide under-voltage release and individual overload protection on all three phases. Motor starter monitoring panels with fault reset push-buttons shall be located on the exterior of the inner compartment door.
 - b. Each pump motor shall be protected by a 3-pole motor circuit protector. The motor circuit protector shall be operated by a toggle-type handle and contain a quick-make, quick-break, over center switching mechanism mechanically trip-free from the handle so contacts cannot be held closed against a short circuit and abnormal currents causing the motor circuit protector to trip. Tripping shall be clearly indicated by the handle automatically assuming a position midway between the normal "ON" and "OFF" positions. All latch surfaces shall be ground and polished. All poles shall be constructed to open, close, and trip simultaneously. The motor circuit protector shall be completely enclosed in a high-strength glass polyester molded case. Ampere ratings shall be clear and visible. Contacts shall be non-welding silver alloy. A manual push to trip button shall be provided for manual exercising of the trip mechanism. Each pole of these motor circuit protectors shall provide instantaneous short circuit protection by means of an adjustable magnetic-only element.
 - c. Each pump motor starter shall be equipped with a current transformer and current transducer to monitor the pump motor amps at the data logger. Each motor starter shall be equipped with a solid-state relay to provide remote start/stop control from the data logger. Each pump motor starter shall be equipped with a run relay with a dry contact to monitor the run status from the data logger.
7. Phase Monitor: A 3-phase monitor shall be installed and wired to disconnect control power from the motor starters in the event of loss of power, phase reversal, loss of any phase or phase balance, or low voltage. The phase monitor shall

automatically reset upon removal of any and all of the preceding conditions.

8. Pilot devices: Pilot devices shall be 30mm heavy duty as manufacturer by Allen-Bradley, or equal.
9. Indicator Lights: Indicator lamps shall be 30mm, as manufactured by Allen-Bradley, or equal. Lamp modules shall use LED lamps and be equipped to operate at 120-volt input. Lamps shall be easily replaceable from the front of the control compartment door without removing lamp module from its mounted position.
10. Power Meter: The panel shall include CTs and power monitor per Square-D PM800 series. The panel shall monitor each leg of the incoming power.
11. Current Transducers: The panel shall include CTs and current transducers for each pump. Current transducers shall be Ohio Semitronics CTRS series. The panel shall monitor one leg of each pump motor feeder.
12. Identification Markers:
 - a. All circuit breakers, control switches, indicator lights, relays, and other control devices shall be identified with permanently affixed legend plates and lamoid-type engraved nameplates where applicable. A black and red on white label stating "DANGER<HIGH VOLTAGE<240 or 480 (use applicable) VOLTS" shall be affixed to the face of the inner door unit.
 - b. Install nameplates using stainless steel drive pins or machine screws. Dymo type labels and labels fastened with adhesive only will not be accepted.
 - c. Install conductor identification markers on conductors at terminations and in junction and pull boxes through which the conductors pass. Color code power conductors by insulation or tape and identifies by markers in junction and pull boxes to indicate the conductor's panel and circuit number. Identify control conductors by markers at all locations.
 - d. Identification markers that are not preprinted, such as panelboard indexes, terminal block marking strips, and special cable markers, shall be typewritten or otherwise mechanically printed, not hand lettered.
13. Spare Parts:
 - a. The manufacturer shall furnish the following parts for each panel supplied:
 - i. Phase Monitor
 - ii. Fuses (10 of each size and type used)
 - iii. Pilot light lamps (10 of each size and type used)
14. SCADA Telemetry Interface:
 - a. Pump Run Status (Each pump)
 - b. Pump Ready Status (Each pump)
 - c. Pump Fault (Each pump)
 - d. Pump Remote Command (Each Pump)
 - e. Incoming Amps
 - f. Pump Amps (Each Pump)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this Contract. All pertinent data and dimensions shall be verified.

3.2 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations.
- B. A certificate from the equipment manufacturer shall be submitted stating that the installation of their equipment is satisfactory, that the equipment is ready for operation, and that the District's operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3.3 FIELD TESTS

- A. In the presence of the District or Engineer, the Contractor shall conduct such tests as necessary to indicate that the pumps and motors conform to the efficiencies and operating conditions specified. A 7-day operating period of the pumps will be required before acceptance. If pump performance does not meet the specified requirements, corrective measures shall be taken or the motor shall be removed and replaced with a motor which satisfies the conditions specified.

END OF SECTION