

SPECIFICATIONS - DETAILED PROVISIONS
Section 15350 - Sewer Pump Station, Manhole Type

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SECTION 15350
SEWER PUMP STATION, MANHOLE TYPE

PART 1 - GENERAL

1.01 DESCRIPTION

The Contractor shall furnish all labor and materials necessary to construct the pumping station in accordance with these specifications and as shown on standard drawing SD-10822, and construction drawings.

1.02 MANHOLE AND WET WELL

The Contractor shall furnish and construct the combination manhole and wet well as shown on the drawings. The concrete used in the cover, base, walls, and top slabs shall comply with the requirements of Section 03300. The walls of the manhole may be constructed of cast-in-place concrete or of precast concrete manhole pipe rings reinforced as shown on the drawings.

Precast concrete shall be manufactured by any process that will produce a dense, homogeneous concrete ring of first quality and shall meet or exceed necessary compression strength. The manhole rings and roof slab shall have a minimum wall and slab thickness as shown on the drawings.

PART 2 - PRODUCTS

2.01 PUMP CONSTRUCTION

The pumps shall be designed and constructed to pump sewage, storm water, heavy sludge and other fibrous materials without injurious damage during operation. The design shall be such that the lifting cover, stator housing, volute casing and impeller are constructed of ASTM 48, Class 30 gray cast iron. The volute shall be of the center discharge design and shall be fitted with ANSI 125 pound flanges and tested to Hydraulic Institute standards at 150 percent of shut-off head. The interfaces between the major castings shall be machined and fitted with BUNA-N-O-RINGS.

The impeller shall be of a non-clog design. The system shall provide efficient sealing between the volute and impeller.

The pump shall be provided with a balanced tandem mechanical seal cartridge type. The seal case shall be constructed of 316 stainless steel with all seal faces and springs immersed in oil. Both sets of faces shall be tungsten carbide silver soldered to stainless steel retainers. Seal faces shall be self-aligning, positively driven, and each is held by separate springs systems. The construction shall be such that no spring is exposed to the pumped media and no mishandling of the seal faces can occur during removal or replacement of the seal.

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Each pump shall be supplied with a slide-away coupling, ANSI 125 cast iron, which bolts to the pump discharge flange and accepts the discharge elbow provided by the pump manufacturer. Seal of the pump at the discharge flange shall be accomplished by a simple downward linear motion of the pump with the entire weight of the pump guided to and pressing against the discharge connection; no part of the pump shall bear directly on the sump floor and no rotary motion of the pump shall be required for sealing. Sealing at the discharge shall be effected by a replaceable rubber seal form fitted to the machine discharge coupling to ensure and guarantee a positive leak-proof system and for ease of removal of the pump. The pump shall be equipped with moisture probes.

2.02 MOTORS

Each submersible sewage pump shall be driven by a completely sealed electric submersible motor 1750 RPM, for operation of 460 volts. The motor nameplate horsepower rating shall not be exceeded by the brake horsepower requirements of the pump for the specified head and GPM conditions.

The submersible pump motor shall be designed for a Class 1 Group D Division 1 hazardous location as defined by the National Electric Code. The unit shall be listed with Underwriters Laboratories as Class 1, Group D, Division 1, explosions-proof, for installation in water or sewage. All electrical parts shall be housed in an air-filled cast iron, water-tight enclosure. The enclosure shall be sealed by the use of "O" rings and shall have rabbet joints with a large overlap. Cable leads shall be epoxy sealed. The motor shaft shall be stainless steel, impervious to the liquid and waste materials being handled. All external hardware including the motor nameplate shall also be made of stainless steel.

Tandem seals, one inside an oil chamber and one outside, shall provide double protection for the electrical parts. Two moisture sensing probes shall be used to detect any influx of liquid past the outer seal and provide ample warning of first seal failure.

Bearings shall be prelubricated at the factory and designed for B10 life of 15,000 hours. Shaft extension bearings shall be locked to prevent shaft movement and to take high thrust loads.

Motor winding shall have a special Class B insulation system with Class F materials for extended motor life. Automatic reset, normally closed thermal overloads shall be installed in adjacent phases of the motor winding to provide the over-heating protection.

Lifting eyes shall be cast into the motor housing and shall be of adequate strength to lift the entire pump motor assembly.

Motor shall be provided with sensing probes for moisture detection.

2.03 ELECTRICAL AND CONTROL SYSTEMS

- A. General. Furnish and install the complete installation as shown on the plans in accordance with the National Electrical Code, latest Edition. The meter and main service switch with a grounding rod, Ufer ground, shall be for 100 amp service 277/480 volt (service section only), 3 phase, 4 wire, NEMA 3R outdoor type. The Contractor is responsible for furnishing and installing the secondary conduit to Southern California Edison Company service transformer in accordance with their requirements, and other conduits, grounding, slab-boxes, and extensions to the S.C.E. point of connection.

All materials and equipment shall be new, shall be the standard products of manufacturers regularly engaged in the production of such equipment shall be the manufacturer's latest standard design, and in the absence of a definite specification shall be approved quality products.

2.04 PUMP CONTROL SYSTEM

- A. General. It is the intention that this specification shall cover a complete Electrical Lift Station Pump System as hereinafter described and all necessary appurtenances which might normally be considered a part of the complete electrical system for this installation. It shall be factory assembled, wired and tested and covered by complete electrical drawings and instructions.

Control, alteration, logic function, alarm and all other control components used in the control system shall be performed as shown on drawings.

- B. Intent of Specification. The Contractor shall furnish, install and place into operation a pump control center designed to automatically operate the pumps as described herein. The pumps will operate in a specified sequence, in response to variations in the liquid level.
- C. Wiring. All wiring shall have not less than 600 volt insulation and be THHN or THWN and all power wiring and bus shall be in complete conformity with the National Electric Code and state and local and NEMA Electrical Standards. All control wiring shall be numbered. All job connections required to conveniently replace control components shall be made at approved type terminal blocks with engraved bakelite marker strips or similar approved means. All wires shall have identification markers at each end as manufactured by Brady or equal. All 120/208 volt wiring shall be color coded as follows: Phase A-Black, Phase B-Red, Phase C-Blue, 277/480 volt Phase A-Brown, Phase B-Orange, Phase C-Yellow.

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- D. U.L. Approved. The control panels shall be constructed in compliance with Underwriters' Laboratories Industrial Control Panels listing and following-up service and utilize U.L. listed and recognized components where applicable. The control panels shall bear the Underwriters' Laboratory listed serialized label.
- E. Power Supply and Metering. The service pole, transformer and meter will be provided by the Southern California Edison. A U.L. rated meter socket and main disconnect switch, conduit between the lift station and slab-box and the power company termination and all other requirements of the utility companies shall be furnished and installed by the contractor. The power supply will be 480 volts, 3 phase, 4 wire, 60 Hertz. The Contractor shall obtain Southern California Edison approval prior to construction for the service entrance meter socket and service switch.
- F. Motor Control Center. Control center shall be NEMA 3R. Each lineup shall consist of one or more vertical sections bolted together to form a rigid and free-standing assembly and shall be designed to permit future additions or regrouping of units. Each section shall have its own door. Motor control centers shall be as manufactured by Allen-Bradley, Furnas, Toshiba, Cutler Hammer or approved equal. All major components and sub-assemblies shall be identified as to function with stamped steel nameplates fastened with screws, or similar approved means. All MCC sections shall have white interior. Galvanized interior is not acceptable.

The following described equipment shall be furnished in each lineup and be matched to the specific pumping station equipment:

1. Incoming power pull section located at the left of the lineup, and section with meter, main switch, and its own lockable door. The manual transfer switch shall be located in the same section with the main switch.
2. Lightning Arrestor. A lightning arrestor shall be supplied in the control and connected to each line of the incoming side of the power input terminals. The arrestor shall protect the control against damage due to lightning strikes on the incoming power line.
3. A magnetic molded case industrial-type circuit breaker shall be supplied as branch circuit protection for each pump motor. The circuit breaker must have a minimum ampere interrupting capacity of 25,000 symmetrical RMS amps at 480 volts.
4. Starters for pump motors shall be direct cross-the-line magnetic motor starter, shall be NEMA rated and manufactured by Allen Bradley, Cutler Hammer or Furnas. Inner door mounted overload reset push buttons shall be provided. The 480 volt panels shall have individual 480/120 VAC control power transformers with primary and secondary fusing for each motor starter.

5. A control power circuit breaker shall be provided and operable through the inner door of the control panel to provide a disconnect means and short circuit protection for any 120 VAC (or less) devices not powered from motor starter circuits. A 120 VAC control power transformer shall be provided where required.
6. Condensation Heater. A 100 watt base, 120 VAC condensation heater/receptacle and adjustable thermostwitch shall be supplied in the control panel.
7. Telemetry. The Contractor shall furnish and install all the required telemetry equipment as listed on the drawings and in Section 2.18 in a 30-inch minimum width enclosure. The section shall contain screw terminal strips with identified wires for all functions shown on the plans. The entire line-up shall be matched cabinets or MCC sections.

2.05 MOTOR STARTER DOOR MODULES

Door module shall provide status/alarm indication and "HAND-OFF-AUTO" selection for each pump and air compressor as shown on drawings.

2.06 AUTOMATIC LIQUID LEVEL CONTROL SYSTEM

- A. Wet Well Level-Responsive Automatic Pump and Alarm Control System. An automatic pump control system shall operate the pumps in accordance with variations in the wet well liquid level. The automatic control system shall employ bubbler control system to sense the liquid level.
- B. Bubbler Control. The liquid level of the wet well shall be measured by sensing the back pressure of compressed air constantly bubbling through a 3/8" dia. hole in the bubbler tube positioned eighteen inches above the bottom of the wet well. Components shall be as indicated and installed per construction drawings.

Mount the bubbler compressor as shown per drawings.

All components not having pressure plate connectors shall be wired using solderless connectors. A marked terminal strip shall be provided. Wiring diagram and heater chart shall be enclosed in panel. All lights, switches and buttons shall be identified by printed metal or engraved nameplates. A red "HIGH VOLTAGE INSIDE" steel nameplate shall be fastened to all doors covering the high voltage compartments.

Panel enclosure shall be welded steel with one (1) coat primer and two (2) finish coats of enamel. The door containing instrument indicators shall provide access to the high voltage compartment and shall be interlocked with the pump disconnect so that access to the high voltage compartment is not possible unless all power is off.

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Equipment shall be manufactured to the standards of the California State Division of Industrial Safety, National Electrical Code and the local Electrical Codes. Required supervision in installing, testing and start-up shall be furnished by factory-trained personnel per the construction drawings. Provide one 1/6 HP air compressor, Model No. 1LAA-11T-M100X as manufactured by GAST for 25 psi regulated air supply, low air relay, flow meter, regulator, gauges, check valves and hose/fittings for a complete system.

2.07 RUNNING TIME METER

A Non-reset type running time meter shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture proof Lexan case with Lucite Cover. The flush mounted dial shall register in hours and tenths of hours of up to 99999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply and shall be as manufactured by YOKOGAWA type 240-2½ " Biglook style.

2.08 OVER-TEMPERATURE JUMP PROTECTION

Over-temperature protection shall be provided in the control panel to operate in conjunction with the over-temperature switch in each pump motor. The control shall provide pump lockout of operation upon occurrence of high temperature. The circuitry shall also include a red failure indicating light on the door for each pump for alarm indication.

2.09 INTRINSICALLY SAFE SENSING CONTROL

The solid state control for the wet well, high indication and the motor seal probes shall be as indicated on the drawing. It shall be capable of utilizing single input pilot device at 120 volt and shall be UL listed.

- A. Float Switch. A float switch shall be provided and the suspended type with single pole mercury switch with normally open contacts supported on pipe as shown on the drawing.

2.10 ELECTROMECHANICAL SEAL FAIL PROBE CONTROL AND PROBES

The control shall be electromechanical type single level service type 2-pole, 120VAC primary, 300VAC secondary, UL listed, and NEMA type 0 enclosure as shown on the drawing. Seal fail probes to be provided with the motor, see Section 2.03.

2.11 SHOP DRAWINGS

A complete set of drawings shall be supplied to insure successful installation and operation of the control system. The shop drawings shall consist of all the following:

- A. Sufficient detail to evaluate compliance with these specifications.
- B. A detailed component list including manufacturer and catalog number.

- C. A custom wiring diagram for this specific application to facilitate and insure accurate field connections to the control panel by electrical installation personnel.
- D. A description of operation for the control system.
- E. An enclosure dimension print.

2.12 FIELD SUPERVISION

The services of a factory trained, qualified representative shall be provided to inspect the completed installation, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment. A minimum of five (5) days shall be allocated for field supervision by the factory representative.

2.13 RADIO TELEMETRY

- A. Provide the following radio telemetry equipment:
 - 1. Motorola INTRAC 2000, Modular Remote Unit Plus
Model F6556
Receive Frequency 952.8375 MHz
Transmit Frequency 928.8375 MHz
 - 2. Configure with:
 - a) Standard Option, 8 Status
 - b) Analog 06 input-AI-6
 - 3. Add the following:
 - a) Antenna, 10db YAGI;
Celwave PD10108
Scala TY900
Decible Products DB499K
 - b) 1¼" Superflex Foam Cable
 - c) 1 RF Protection NF/NF Flange; Poly Phaser 1S-B50LN-C2 or equal
 - d) 4; "N" Male connectors

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- B. The antenna mast will consist of a 10' section of 1½" rigid conduit mounted with unistrut at the telemetry side of the control cabinet, extending approximately 4' above cabinet. Approximately 6" below the mast, mount the RF Protection & ground it to a dedicated rod. The Superflex foam cable will be installed in two sections. The first from the antenna to the RF Protection. The second from the RF Protection to the radio. All antenna cable connections and entry point into the cabinet will be appropriately sealed to prevent moisture intrusion.
- C. The installation shall include all materials, equipment and accessories not specifically mentioned or shown on the drawings, but which are necessary to make a complete working installation of the telemetry system.
- D. In order for these frequencies to perform properly a radio path to Sky Mesa Repeater Site is required. This site is located at Lat 33-46-34 N; Lon 117-06-23 W; Elev 2750. It is recommended that the new facility coordinates and elevation are provided to the District's Communications and Control Systems Analyst for verification of radio path.

2.14 MAGNETIC FLOWMETER/SIGNAL CONVERTER

- A. The flowmeter shall be a pulsed DC type with an analog signal converter as an integral part of the flowmeter. The input voltage shall be 120 V.A.C., output signal shall be 4-20MA DC. Response time shall be 1 second minimum, with zero return. Enclosure to be NEMA 4X. The liner material shall be polyurethane, 6" in diameter. Flange pressure rating is ANSI class 150, flange material to be 304 SS with 316 SS protector plate; electrode shall be bullet nose of 316 SST material. Flowmeter to be similar or equal to Fischer-Porter series 3000, COPA-X0.

2.15 CIRCULAR CHART RECORDER/TOTALIZER

The chart recorder shall be a microprocessor based recorder. The Recorder shall a circular type 100mm; chart speed of 1-4096 hours per revolution, 40 character, Vacuum fluorescent digital display and integral keypad. Temperature rating shall be 0-50°c, 10-90% humidity. Input resolution is .01% of operating gain span, pen response is 5 seconds full scale, channel shall be scanned every 500 msec. Display accuracy of .02% of operating gain span. Recorder shall have the optional totalizer and a scaled 4-20 ma retransmission with necessary power supply wired to the analog input of the radio telemetry. Case shall be mounted into the cut out of a motor control center similar to Fischer-Porter model 1392.

PART 3 - ELECTRICAL WORK

3.01 GENERAL

The Contractor shall furnish all labor, materials and transportation for the complete installation of all electrical conduit, wiring, motor control center and equipment, and all appurtenances as shown on the drawing and/or specified herein. The work shall include all electrical connections and wiring to all mechanical equipment to be installed by the Contractor. All material furnished shall be new and of the highest quality. The installation shall be complete, tested and ready for operation.

3.02 CODE RULES

All work shall be in accordance with the latest rules of the National Electrical Code, Electrical Safety Orders of the Department of Industrial Relations of the State of California, and any prevailing ordinances, rules, and regulations of the local governing bodies. Where drawings or specifications call for equipment and workmanship to be of better quality or higher standard than required by the above rules and regulations, then said drawings and specifications shall prevail. The Contractor shall obtain all permits and inspections and he shall pay all fees therefore. The Contractor shall deliver certificates of inspection to the Engineer.

3.03 TESTS

The entire installation shall be free from improper grounds and from short circuits. After completion of wiring and energizing of services, the Contractor shall test all completed circuits and shall correct any defects that may exist.

3.04 SHOP DRAWINGS

The Contractor shall furnish to the Engineer required shop drawings of all equipment for review before fabrication of such equipment. Drawings submitted for review shall include front views, sections, floor plans, anchoring details, and locations for conduit. Separate drawings shall be submitted for schematic and connection diagrams. Connection diagrams shall be complete for all electrical equipment furnished. Schematic diagrams shall have designated numbers corresponding with connection diagram terminal numbers. Should an error be found in a shop drawing during installation of equipment, the correction, including any field changes found necessary, shall be noted on the drawing and submitted for review again. All shop drawings shall be checked by the manufacturer's engineering department before submittal for review by the Engineer.

3.05 CONDUIT (RIGID)

- A. All conduit shall be Polyvinyl chloride (PVC) Schedule 40 conduit of new material and of standard manufacture, and shall meet all requirements of the National Electrical Code.
- B. Running threads shall not be used, and where some such device is necessary, Erickson couplings or approved equal shall be used. All conduits must be kept dry and free from water or debris with approved pipe plugs or caps during construction.

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- C. All exposed conduit shall be installed straight and true with reference to adjacent construction and shall be supported by means of approved standard pipe straps or brackets.
- D. All conduits entering outlet boxes, pull boxes or terminal cabinets shall be secured in place by means of two locknuts and one bushing shall be screwed over every conduit (in pull boxes, junction boxes, switch panels, etc.).
- E. Before any wire is drawn into the conduits, all boxes and conduits shall be cleaned of obstructions and dirt. Any moisture contained in the conduit system shall be blown out.
- F. All underground or directly in earth rigid conduit not shown encased in concrete or run in slab shall have a polyvinyl chloride coating as manufactured by Pittsburgh Standard Conduit Company, Verona, Pennsylvania, or approved equal; or shall be prewrapped with a 20-mil adhesive polyvinyl chloride tape to a minimum thickness of 40 mils. Fittings and couplings shall first be primed then wrapped with polyvinyl chloride tape to a 400-mil thickness, in accordance with the manufacturer's instruction. If the contractor elects to install prewrapped conduit, a sample shall be submitted to the Engineer for approval prior to installation.
- G. All conduit ends shall be capped by the use of conduit pennies and bushings until placed in service.
- H. Conduits stubbed up through slabs shall be placed exactly in accordance with equipment requirements and shall be located within a curb or equipment base pad.

3.06 CONDUIT FITTINGS AND BOXES

- A. All conduit fittings shall be galvanized steel. Conduits shall be Crouse-Hinds, Appleton, or approved equal.
- B. All pull boxes, junction boxes, outlet boxes, etc., shall be of galvanized steel unless otherwise noted on the drawings.
- C. All outside junction boxes and conduits shall be sealed with a galvanized gasketed cover screwed tightly to the box.
- D. All small boxes shall be packed with paper or other stuffing to prevent concrete or other foreign material from filling the boxes.
- E. The size of pull boxes and junction boxes shall be as required for this installation unless otherwise shown.

3.07 WIRE

The Contractor shall furnish all stranded wire and cable to make a complete installation of the electrical equipment as outlined herein and as shown.

3.08 GROUNDING

All conduit systems and metal frames of all equipment shall be permanently and effectively grounded to a 3/4-inch diameter, 8-foot long copper-clad ground rod by means of approved ground clamps in accordance with the NEC and measured for 25 ohms or less and in accordance with Article 250-84 and Electrical Safety Orders of the Department of Industrial Relations of the State of California.

3.09 ALARM CIRCUITS

The Contractor shall install a High Level wet well alarm system which shall include a float switch, the alarm circuit, and the alarm relay in the pump control section of the panel. Location of the float switch is shown on the contract drawings.

PART 4 - EXECUTION

4.01 EQUIPMENT TESTING

The purpose of equipment testing is to demonstrate that the pump units meet the specified requirements.

- A. Tests shall be performed on the actual assembled unit over the entire operating range on the certified performance curve. Prototype model tests will not be acceptable.
- B. All pumps 10 to 50 horsepower shall be factory-tested in accordance with the above specifications. Pumps larger than 50 horsepower may be subject to a "factory witness test" attended by a District representative. The District shall be notified at least 2 weeks in advance such that a representative can witness the pump testing. Certified test results shall be submitted to the Engineer for approval prior to shipment.
- C. Pump curves shall reflect data secured during actual test runs and shall be signed by a responsible representative of the pump manufacture. Test reports and procedures shall conform to applicable requirements of the Hydraulic Institute Standards.

4.02 INSTALLATION

The Contractor shall install all pumping equipment in strict accordance with the manufacturer's instructions. Care shall be used in handling to avoid bumping, twisting, dropping, or otherwise damaging the equipment.

All pump manufacturers shall furnish the services of factory-trained personnel as required to examine the installation, supervise start-up of equipment installed, and repair the equipment at no additional expense to the District.

4.03 FIELD ACCEPTANCE TEST

The contractor under this specification shall have full responsibility for the proper installation and performance of said pumping equipment, including furnishing the services of a pumping equipment Field Service Engineer to inspect equipment installation, and to adjust, if necessary, any portion of the pumping equipment required herein. The manufacturer's field Service Engineer shall assist the District in the proper conduct of pumping unit field acceptance tests. The pump units shall perform in the field as shown on the certified pump curves furnished by the Contractor. Tests shall also demonstrate operation without cavitation, vibration, overheating of moving parts, and excessive noise. The Contractor and pump manufacturer shall make necessary corrections to achieve smooth pump operation. In the event the tests reveal noncompliance of the workmanship or equipment, the Contractor shall either make alterations as necessary or replace the pumps in order to meet the requirements of the specifications at no additional cost to the District.

4.04 CERTIFICATION OF INSTALLATION

The Contractor shall submit a letter to the District confirming that all pumping equipment was inspected, operation checked, and installation approved in writing by the respective pumping equipment supplier.

4.05 WARRANTY

All pumping equipment shall carry an extended warranty for a two year period from the date of **acceptance**. All warranties shall be turned into the District prior to project completion.

4.06 MAINTENANCE BOND FOR PUMPING EQUIPMENT

The contractor or his supplier shall provide a maintenance bond (see EMWD standard form C-14 or C-14.1) from a bonding company acceptable to the District equal to 100% of the pumping equipment value (including motors, pumps and pump assemblies) for a two (2) year term starting when the District has accepted the contracted work. Equipment and/or components failing within this period due to deficiency in design, workmanship or material shall be removed, replaced, and reinstalled at no cost to the District, and said replacement shall be guaranteed for two years continuous service. The maintenance bond shall be submitted to the District prior to the performance test of the pump(s).

END OF SECTION 15350