

SPECIAL PROVISIONS PART 10 20 10
(Revised 7-14-16)
SOUND ATTENUATED SKID MOUNTED,
DIESEL ENGINE-DRIVEN BACK-UP PUMPS



10 20 10.1 General

This special provision covers the supply of diesel driven pumps and shall be used in combination with the latest Hydraulic Institute Standards and all other applicable specifications contained in the contract documents. When there is a discrepancy between this Special Provision and Hydraulic Institute Standards, this Special Provision shall take precedence.

The OWNER is Pima County Regional Wastewater and Reclamation Department (PCRWRD).

The term CONTRACTOR refers to the company engaged in the installation of all diesel driven pumps listed within this special provision.

The term VENDOR refers to the diesel driven pump manufacturer's representative. The CONTRACTOR is responsible for managing and overlooking the quality control of the VENDOR to ensure that the quality of the product meets or exceeds the requirements listed within this special provision.

All diesel driven pumps shall be furnished as indicated on the Plans, or as specified herein. It is the intent of these Special Provisions to obtain sewage pumps of heavy-duty construction for heavy-duty continuous service or for intermittent service, whichever imposes the most severe service on the pump.

Each diesel driven pump package includes a complete sound attenuated enclosure, skid mount, diesel engine, UL Listed fuel tank, associated engine controller, casing, impeller, shaft, shaft sleeve, and case wear ring. Each pump shall be furnished as a complete, ready-to-install unit by a single supplier, including but not limited to, pump, motor, and mountings.

Each pump shall be a third party witnessed certified tested and OWNER approved prior to shipment. A written certification shall be supplied from the manufacturer that the entire pump assembly and warranty will be provided by the pump manufacturer. The written certification(s) shall be submitted at the same time the pump data is submitted for OWNER's approval.

Impellers, cases, seals, shafts, bearings, and any other item, which does not comply with the Specifications as to their metallurgy, material, or hardness, shall be replaced without additional cost to the OWNER for new parts, removal, and replacement.

Pump shall be Godwin Model DBS HL-250M or ENGINEER/OWNER Approved Equal.

Any engineering modifications or design changes made because of an alternate selection shall be paid for by the CONTRACTOR.

Training, installation and testing shall be per Special Provisions Part 10 30 00 for all diesel driven pumps.

10 20 10.2 Work Included

The work under this section shall consist of furnishing all labor, materials, equipment, and appurtenances required for the field installation and testing of a diesel driven pump, in accordance with the details shown on the Plans and the requirements of these Special Provisions.

10 20 10.3 Operating and Design Conditions

Pump shall be capable of operating in continuous and intermittent non-submerged conditions and be permanently connected to inlet and outlet pipes.

The pump will be located outdoors and exposed to the elements at all times. Pumps shall be designed for operation in conditions as listed in Special Provisions Part 01 00 00.

Pumps shall be designed to pump raw sewage, and shall be capable of passing solids a minimum of 2 9/16-inches in diameter or more per Arizona Department of Environmental Quality (ADEQ) requirements.

Engine speed shall be adjustable to operate the pump between maximum and minimum design operation speeds in manual mode. The engine shall be equipped with a factory installed controller designed to start/stop the engine at a signal supplied by a 4-20 mA transducer, with backup high and low level shutoff floats or. The setting for the floats shall be as described within **Table 1** below. The controller shall be weather proof enclosed, and contain an external weatherproof keypad accessible without the need to remove or open any protective cover or enclosure. The keypad shall operate in extreme temperatures, with gloves, rain, mud, grease, etc. and maintain complete weather-tight sealing.

The pumps controls shall be set to maintain a certain elevation within the wet well, as dictated by the plans.

The pumps controls shall be set to alternate between the different pumps to provide even wear on the pumps, and to minimize the amount of times the pumps turn on and off in an hour.

Diesel driven pumps shall be capable of the performance characteristics as listed in **Table 1** below.

Table 1. Critical Flow and TDH Requirements

Flow per Pump (GPM)	# Pumps in Operation	TDH
1,300	1	151
2,100	2	300
3,050	3	253

The maximum net positive suction head required at the critical design points shall not exceed 12-feet.

10 20 10.4 Technical Specifications

The pumps shall be non-clogging, wastewater, diesel driven design. All major pump components shall be of grey cast iron, ASTM A-48, Class 35B or better. All components shall have a smooth surface, devoid of blow holes or other casting irregularities. The pump internals shall be capable of being serviced without disturbing system piping.

All exposed nuts or bolts shall be AISI type 316 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Pump castings shall be cast iron. Pump design shall incorporate a direct suction flow path that is in axial alignment with the impeller eye. There shall be no turns, chambers, or valves between the suction flange and the impeller eye.

The pump impeller shall be a non-clog type with pump out vanes on the back shroud. The impeller shall be three-bladed of hardened cast chromium steel construction. The impeller shall be fitted to the drive shaft by use of a multi-fluted spline.

Pump shall be fitted with a fully adjustable and replaceable, front wearplate cast in cast iron having minimum 1-1.5% chromium and 2% nickel composition, and rear wearplate cast in cast iron (minimum ASTM A48 Class 30). Wearplate clearances shall have no relationship to the ability of the pump to achieve a prime.

Pump shall be fitted with a bearing bracket which contains the shaft, two sets of heavy duty angular contact ball bearings at the drive end and cylindrical roller bearings on the hydraulic end. Bearings shall be of adequate size to withstand imposed loads and up to 100 psi of suction pressure. Minimum ISO L10 bearing life to be 100,000 hours. Impeller shafts shall be of 1½% nickel/chromium alloy.

Seals shall be high pressure, capable of withstanding suction pressures to 100 psi. The pump seal will be a double mechanical seal arrangement designed to meet API Standards. The inboard mechanical seal shall be a mechanical self-adjusting type with both interfaces of reaction bonded solid silicon carbide. The outboard mechanical seal shall also be a mechanical self-adjusting type with reaction bonded solid silicon

carbide and carbon interfaces. The mechanical seal shall be cooled and lubricated in its own cooling reservoir, requiring no maintenance or adjustment. Pump shall be capable of running dry, with no damage, for periods up to 24 hours. Elastomers shall be Viton.

Pump shall have suction and discharge flanges made of cast iron ANSI (B16.1) Class 150, raised faced, pump gaskets shall be compressed fiber and/or Teflon and pump O-rings shall be Buna-N.

Pump shall be fitted with a fully automatic priming system incorporating a twin-cylinder compressor and air ejector assembly, or approved equal. The compressor shall be installed on the engine auxiliary drive and shall be gear driven, lubricated and cooled from the engine. The priming system shall require no fail-safe protection float gear or any adjusting at high or low suction lifts. The pump must be capable of running totally dry for periods up to 24-hr, then re-priming and returning to normal pumping volumes. Pump and priming system shall be capable of priming the pump from a completely dry pump casing. The pump shall be capable of static suction lifts to meet all NPSH requirements. It shall also be capable of operation using extended suction lines. Equipment acceptance shall be contingent upon the pump's ability to run continuously at full speed in a completely dry condition for periods up to 24 hours. The ENGINEER or OWNER may require a demonstration of the pumps capabilities prior to procurement.

Pump shall be supplied with an integral ductile iron swing type check valve mounted on the discharge flange of the pump, allowing unrestricted flow into the impeller. The check valve shall prevent in-line return of flow when the pump is shut off. Non-return valve elastomers shall be Nitrile Rubber, and shall be field replaceable.

The electronic type drive unit shall be a diesel water-cooled engine. The engine shall drive pump by use of a direct-connected intermediate drive plate. Starter shall be 24 volt electric. Low oil pressure safety shutdown, high temperature shutdown, tachometer, and hour-meter shall be integrated into engine control panel. Battery shall have 180-amp hour rating. Unit shall be a Final Tier 4 design Caterpillar C15 or ENGINEER/OWNER approved equal. A Tier 3 Flex Engine will be considered as an approved equal assuming that it meets all other performance requirements. A certified continuous duty engine curve shall be supplied to the OWNER/ENGINEER. The exhaust system shall include a muffler of suitable size per the engine manufacturer.

The pump and engine shall be capable of being limited to a specific speed range that can be field adjusted to match the system requirements. For the Godwin Model DBS HL-250M pump and Final Tier 4 design Caterpillar C15 engine, the engine shall be set up to operate within an RPM range between 1,200 and 1,800 RPM. At the CONTRACTOR's expense, this range will be required to be redesigned to fit the systems requirements if a different pump or engine is selected.

The pump base tank shall be a UL-142 approved double wall design constructed in accordance with Flammable and Combustible Liquids Code, NFPA 30; The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines, NFPA 37; and The Standard for Emergency and Standby Power Systems, NFPA 110.

The tank design shall be a Closed Top Dike Pump Base Tank. It shall be of double wall construction having a primary tank to contain the diesel fuel, held within another tank or dike, which is intended to collect and contain any accidental leakage from the primary fuel tank. The completed base tank assembly is to incorporate pump-mounting locations and must be able to support four times the rated load.

The primary tank shall be designed to withstand normal and emergency internal pressures and external loads. The primary tank shall be capable of withstanding internal air pressures of 3 to 5 psig without showing signs of excessive or permanent distortion and 25-psig hydrostatic pressure without evidence of rupture or leakage.

The primary and secondary tanks or dike shall have venting provisions to prevent the development of vacuum or pressure capable of distorting them as a result of the atmospheric temperature changes or while emptying or filling. The vent shall also permit the relief of internal pressures caused by exposure to fires. The vent size shall be determined by using the calculated wetted surface area in square feet (the top is excluded) in conjunction with venting capacity table 10.1 of UL-142. The tank's vent shall also be equipped with a coupling device and shall be located to facilitate connection to a vent piping system. The dike's vent may be an opening for venting directly to the atmosphere and protection from the entrance of natural elements or debris shall be provided.

The primary tank is to be constructed of 7 gauge ASTM A569 or A-36 hot rolled steel. Internal baffles or reinforcement plates shall be located on a maximum of 24 inch centers in tanks up to 60 inch width and on a maximum of 19.5 inch centers in tanks over 60 inch width. At least one baffle shall separate the fuel suction pipe from the fuel return line.

The outer tank is to be constructed in a manner to be able to support four times the wet load of the pump and housing. The entire load is to be carried by the outer tank so no load or vibration stress is placed on the primary tank. If the pump base tank is wider than the pump set to be supported, structural rails are to be incorporated to span the width of the base tank so that the load is transferred to the side rails of the tank. Vertical reinforcements shall be welded to the outer sides of the secondary tank or dike at a maximum of 45-inch centers on tanks up to 30 inches high and on 24-inch centers on tanks greater than 30 inches high. At least one vertical reinforcement shall be positioned adjacent to each mounting hole location.

Both primary and secondary tanks shall be fitted with the proper welded pipe fittings to accommodate the requirements for the fill port and normal and emergency venting.

The completed assembly is to be cleaned with a heated pressure wash followed by a chromium free post treatment to ensure proper paint adhesion. The tank assembly is to be painted with an epoxy ester primer and high quality polyurethane enamel with total paint thickness of 3.5 mils. The painted tank assembly is to be baked at 180 degrees for 30 minutes to provide a hard durable finish.

The footprint of the pump shall be capable of being installed within the provided vault. 3-feet of spacing shall be provided around all equipment for maintenance purposes. The layout of the pumps shall be approved by the OWNER prior to procurement and any engineering or design changes than other than in the contract drawings will be paid for by the Contractor.

The engine and pump shall be completely enclosed with 12-gauge sheet metal panels (doors 14-gauge) backed with 1" and 2" layers of polydamp acoustical sound deadening material. The acoustical enclosure shall reduce pump and engine noise to a maximum of seventy (70) dBA or less at a distance of 30 feet. The panels shall be removable for easy access to the engine / pump for maintenance and repair. The engine control panel shall have a locking door for visual inspection. For maintenance and service needs, the pump discharge side of the trailer shall have a hinged door for quick access to the engine oil fill, fuel fill port, oil dipstick and filters

The complete pump and sound enclosure shall be skid mounted by the manufacture of the pump.

Pumps shall be equipped with the capability of storing 24-hours' worth of fuel at maximum rated flow.

Pump rotation shall be as required for proper orientation per plans.

The engine shall be started, stopped, and controlled by a PrimeGuard high performance state of the art digital controller, or approved equal, as supplied by the manufacture of the pump. The controller shall be weather proof enclosed, and contain an external weatherproof 12-position keypad accessible without the need to remove or open any protective cover or enclosure. It shall be designed to start/stop the engine at a signal supplied by high and low level floats or a 4-20 mA transducer. The PrimeGuard controller shall provide the following functions without modification, factory recalibration, or change of chips or boards, by simply accessing the keypad. All information on the PrimeGuard Controller shall be submitted to the OWNER for approval.

In automatic mode, the unit shall conserve energy and go to "sleep" (90mA parasitic battery draw).

The PrimeGuard controller shall function interchangeably from float switches, or level transducer, as well as manual start/stop by selection at the keypad. No other equipment or hardware changes are required.

The PrimeGuard controller shall be capable of varying the engine speed to maintain a constant level in a process without a change to the controller other than via the keypad.

The start function can be programmed to provide three separate functions each day for seven days (i.e. a start, warm up, exercise cycle on two separate days at different times and for a varying length of time all via the keypad).

The PrimeGuard controller shall have only one circuit board with eight built-in relays. Three (3) of the relays shall be programmable to output desired parameter on display and to be used as dry-contacts for

communication with City/Municipality supervisory control and data acquisition (SCADA) system, all via the keypad without changing relays, chips, printed circuits, or any hardware or software.

Standard components shall consist of (24) digital inputs, (7) analog inputs, (1) magnetic pick-up input, (8) 20-amp form "C" relays, (1) RS232 port, (1) RS485 port, (1) RS232/RS485 port, (1) J1939 port, and (1) 64X128 pixel full graphic LCD display with backlight.

The industrially-hardened PrimeGuard Controller shall withstand Vibration of 3 g, 3 axis, frequency swept 10-1000 Hz, in an operating temperature Range of 4° to 176°F (-20° to 80°C) and an operating humidity range of 0-95% Non-Condensing.

The Dri-Prime Backup System (DBS), or approved equal, unit shall include a fully automatic trickle charger powered by 2-amp, 110 VAC.

The DBS drive unit shall be supplied with an engine block coolant heater (20-amp, 115 VAC required).

The DBS unit shall include one (1) mechanical timer operated internal 12VDC powered light.

The DBS unit shall include three (3) dry contacts for SCADA system integration.

The unit shall include a 4-20 mA submersible level transducer. The transducer assembly shall be integrated into the engine control panel via a 7-Pin connector and be an MJK Expert 3400, or ENGINEER approved equal.

The pump station shall be capable of providing a remote monitoring system to allow the OWNER to visually inspect the pump station's status via a web-hosted site as provided by the pump manufacturer. The remote monitoring system shall be required to be utilized throughout the entire construction period for the upgrades of the existing pump station. The OWNER shall reserve the right to cancel or maintain their subscription after construction of the existing system is complete and full operational control is resumed by the OWNER. Minimum monitoring requirements for the system shall include, but are not limited to, the following:

- Password Protected Website
- GPS with Map View
- Real time data viewing including the following:
 - Date
 - Time
 - Engine status manual/auto
 - Pump on/off
 - Battery voltage
 - Engine RPM
 - Engine temperature
 - Oil pressure

- Engine hours
- Suction pressure/vacuum
- Discharge pressure
- Flowrate
- Fuel level (with ES2F fuel sender)
- Engine soot level (T4 engines)
- Sump level
- Alarms
- Alarm emails when pump starts
- Data recording downloadable to a :CSV
- Remote (web based) start/stop control
- Geofencing
- Satellite communication
- GSM cellular communication
- Smartphone compatible

The pump station shall be equipped with an auto dialer system that can tie in to a cellular network and report system alarms (high level, low fuel, etc.) per the OWNER's requirements

10 20 10.5 Quality Assurance, Inspection and Testing

A. Quality Assurance:

1. VENDOR shall furnish to the CONTRACTOR, for OWNER's approval, the quality assurance program to be applied during the preparation and fabrication of the pumps at the time of proposal. The program shall describe the measures to be used to control activities affecting the quality of the equipment to be supplied in compliance with this Special Provision.
2. Written certification shall be furnished by the VENDOR that the equipment has been manufactured in compliance with the quality assurance program and the requirements of the procurement documents. This certification will be furnished to the OWNER for approval before final payment of the Purchase Order.

B. Shop Assembly, Inspection, and Testing:

1. The equipment shall be completely shop assembled and inspected prior to shipment to check for correct fit up and for compliance with Specification requirements.
2. The OWNER reserves the option to inspect the equipment in the VENDOR's shop.
3. Shop inspection of fabrication and materials shall not constitute final acceptance.

4. Each pump shall be certified factory performance tested for hydraulic and mechanical integrity in accordance with the latest requirements of the Hydraulic Institute Standards Section ANSI/HI 1.6.5. Records of all tests performed shall be submitted to the OWNER for approval, prior to the final payment of the Purchase Order. Pump must meet Acceptance Level "A" for flow, head, and efficiency.
5. Each pump shall be factory hydrostatically tested per Hydraulic Institute standards and name-plated before shipment. It shall then be thoroughly cleaned prior to shipment.
6. Pumps that have mechanical defects or do not meet the range of head-capacity characteristics, horsepower, efficiency, and vibration requirements listed in the ANSI/HI 1.6 will be rejected after testing and shall be replaced without additional cost to the OWNER for furnishing, removal, reinstallation, and retesting. Mechanical defects shall include excessive vibration, improper balancing of any rotating parts, improper tolerances, binding, excessive bearing heating, defective materials, including materials that do not conform to the specifications, improper fitting of parts, and any other defect which will in time damage the pump or unreasonably impair the efficiency of the pump.
7. The warranty period for the equipment specified herein shall be one year after final approval by the OWNER. The OWNER will provide final approval for the station after it has run for 14 continuous days with no issues in pumping or controls. The OWNER will be responsible for normal maintenance (oil changes, etc.) after the time of acceptance. See Special Provision Part 10 30 00 for more information. VENDOR shall retain originals of all test reports through the duration of the equipment warranty period. All warranties shall be provided with a preliminary layout including the language stating the applicable warranty coverages to the OWNER for approval. A signed final warranty shall be provided to the OWNER, and shall be equipped with the agreed upon date of expiration.

10 20 10.6 Shipping and Handling

The unit shall be shipped in such manner that no damage will result to any part. Every precaution shall be exercised in handling so as not to impose any strain on any parts of the pump.

The weight, quantity, and approximate overall dimensions of each pump shall be furnished with the bid.

Shipping lists and delivery dates shall be mailed to and received by the OWNER prior to the day the equipment leaves the shop.

VENDOR shall be responsible for coordinating shipping schedule as per priorities with the OWNER.

A standard 3" x 5" red shipping tag shall be wired to each pump. This tag shall state the VENDOR's name and address, OWNER's name, tag number, job site address, and Purchase Order number.

10 20 10.7 Information Required

VENDOR shall furnish two sets of installation, operation and maintenance instructions along with a pdf version on a CD. These instructions shall include detailed instructions for adjustment and recommendations for the proper type of lubricant and parts list with part number and description of material supplied. Installation and operation manual shall also include certified pump data and motor test data that is specified. Safe storage instructions shall be included.

VENDOR furnished drawings shall show all details and dimensions, design features, thrusts, weights, and construction materials. Performance curve shall show the head and corresponding capacity for the full pump range, the curve shall also include efficiency, horsepower, full-load amps, and NPSH. Pump curves shall not be a catalog curve but shall be the actual operating curve of the impeller diameter offered.

VENDOR shall provide final as-built drawings following completed manufacturing of diesel driven pumps.

VENDOR shall provide a list of recommended parts for general maintenance.

VENDOR shall provide a list of recommended emergency spare parts.

1. The information shall be submitted in tabular form to include the following for each pump offered, as appropriate:
 - Name of pump manufacturer
 - Impeller material — ASTM specification
 - Pump shaft material — ASTM specification
 - Trimmed impeller size
 - Pump shaft diameter
 - Head-capacity, efficiency, horsepower, and NPSH curves
 - Bearing material — ASTM specification
 - Type and make of shaft seal
 - Foundation plate material — ASTM specification

2. VENDOR shall list any exceptions to these Special Provisions in the proposal.

10 20 10.8 Vendor Document Schedule

VENDOR shall furnish all required shop drawings and affiliated layout information within four (4) weeks of the approved purchase order.

Design ENGINEER shall have two (2) weeks after receipt of shop drawings and affiliated layout information for review and comment.

VENDOR shall have three (3) weeks to address ENGINEER's comments and re-submit all necessary shop drawings and affiliated layout information.

10 20 10.9 Diesel Driven Pump Nameplate

Equipment nameplates shall be engraved or stamped on stainless steel and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. The nameplate shall be factory installed. An additional nameplate for each pump shall be provided with each owner's manual submitted for the OWNER's records.

Nameplates shall be capable of meeting 720 hour salt spray test per ASTM B117-90.

Each nameplate shall be engraved with the following information:

- Manufacturer's Type – Model#
- Serial Number
- Catalog Number
- Nominal HP
- Efficiency Rating
- Design GPM
- Design TDH
- Impeller Diameter
- Impeller Material
- RPM

10 20 10.10 Attachments

The following documents are attached to be made part of this Special Provision:

- Special Provision 01 00 00
- Special Provision 10 30 00

END OF SPECIAL PROVISIONS PART 10 20 10