

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATIONS
(Texas)**

**PUMPING PLANT
Code 533B
LIVESTOCK WATER SYSTEM – ELECTRIC SUBMERSIBLE PUMPING UNITS
(No.)**

1. SCOPE

These construction specifications cover the materials and installation of electric submersible pumps. They **do not** include the installation of the well.

2. PUBLIC AND PRIVATE UTILITIES

Utilities are defined to be overhead and underground power or communication lines, and pipelines. The contractor should conduct their own search and discovery for utilities in order to lessen or avoid potential damages. The owner/operator shall complete TX-ENG-80, UTILITIES INVENTORY prior to any ground disturbance and return it to a USDA-NRCS representative.

3. EQUIPMENT

- a. Submersible Pump: The submersible pump and motor shall have stainless steel, plastic, or bronze impellers, and shall be capable of delivering the required capacity (GPM) at the head shown on the design.
- b. Electric Motor: The motor shall be a 220-volt, 60-hz, single or three-phase motor, NEMA Standard MG 1, and rated at the HP shown on the design. The motor shall have sufficient power to efficiently and continuously operate the pump at the listed capacity and head without exceeding the normal horsepower rating. The service factor shall apply to infrequent short-time overloads only, and should not be infringed upon during normal operating conditions. The motor shall also be provided with a watertight plug-in type motor lead connector.
- c. Accessories:
 - (1) *Motor Controller*: The motor controller for single phase motors shall be the product of the pump motor manufacturer and shall be designed to function with the associated motor.
 - (2) *Lightning Arresters*: Lightning arresters shall be either separately mounted or an integral part of the motor.
 - (3) *Conductors (Power Cable)*: The power cable supplying the motor shall be of a type suitable for the application and meet applicable National Electric Code (NEC) standards, with adequate strength for the length of cable vertically supported in the well. The cable shall be new neoprene-jacketed vulcanized submersible pump cable. Conductor insulation (Type RHW) shall be bonded to the conductor. The cable shall be sized to limit the voltage drop to no more than 3-percent at the motor terminals, and shall be not less than AWG No. 12.

- (4) *Pressure Switches*: Pressure switches shall be equal to products of the Square D Company.
- (5) *Drop Pipe*: The drop pipe diameter, type, and length shall be as shown on the design, and the type shall be one of the following:
 - (a) Galvanized steel drop pipe consisting of 21-foot joints of reamed galvanized pipe, threaded and complete, with long couplings having a quality equal to the pipe. The pipe shall be Schedule 40 and meet ASTM-A-53.
 - (b) Polyvinyl chloride (PVC) pipe consisting of 20-foot joints with couplings having a quality equal to the pipe. The pipe shall be PVC 1120, Schedule 80, conforming to ASTM-D-1785.
 - (c) Polyethylene (PE) pipe with couplings having a quality equal to the pipe. The pipe shall be PE 3406, SDR-7, 160-PSI, conforming to ASTM-D-2239.
- (6) *Check Valves*: Check valve(s) shall be Flow-matic No. 80 or equal.
- (7) *Torque Arrestors*: Torque arrestor(s) shall be Harvard TA 48 or equal.
- (8) *Pitless Unit and Adapter*: Where the well discharge pipe is below ground, a pitless unit and adapter shall be used to connect the discharge pipe from the well to the casing below the frost line. A pitless unit and adapter are not required if the discharge pipe from the well is connected above ground.
- (9) *Sanitary Well Seal*: A split-base, two-hole style for submersible pumps that will fit the well casing and the drop pipe will be used. The seal and its installation shall be capable of preventing pollutants from entering the well. The seal will be of suitable strength to support the specified drop pipe, pump and motor weight, including a reasonable safety factor. The seal shall have an access tapping and plug.
- (10) *Concrete Pad*: A concrete pad shall be constructed from 3,000-psi, 28-day compression strength concrete with a slump between 2 and 5-inches and maximum aggregate size of 2-1/2-inch for wells that can not be documented to meet the Texas Administrative Code; Title 16 Economic Regulation; Part 4 Texas Department of Licensing and Regulation (TDLR); Chapter 76 Water Well Drillers and Water Well Pump Installers Administrative Rules, <http://www.license.state.tx.us/wwd/wwdrules.htm>. The concrete shall be reinforced with 6-inch by 6-inch by 10-gage welded wire mesh.

4. **INSTALLATION**

- a. Submersible Pump: The pump shall be installed in accordance with the manufacturer's recommendations. The pump shall be installed a minimum of 10-feet above the bottom of the well and a minimum of 15-feet below the lowest pumping water level. Submersible pumps which are not immersed in water shall not be energized for more than 3-seconds at not less than 10-minute intervals, unless written approval is obtained from the manufacturer to do so.

b. Conductors (Power Cable):

- (1) *General*: The Installer shall install the required wiring, controls, and junction box, complete from the junction box to the pump.
- (2) *Splicing*: The power cable shall be furnished in one continuous length within the well where possible. Electrical splices within the well shall only be allowed above the static water level and shall be completed using a water tight wire connector; no friction or waterproof taping of splices is allowed. Splices at other locations shall be as recommended by the manufacturer.
- (3) *Clamps*: A stainless steel clamp shall be used below each drop pipe joint, to tie the power cable to the drop pipe. The Installer shall protect the cable at each stainless steel clamp with a 3-inch-long piece of polyethylene plastic, split on one side and placed around the drop pipe between the cable and clamp.
- (4) *Taping*: Four turns of 3/4-inch plastic tape at each joint can be substituted for the stainless steel clamps specified above in (3). However, the Installer shall also tie the power cable to the drop pipe with four turns of 3/4-inch plastic tape equally spaced between joints not to exceed 10-feet.
- (5) *Lowering into Well*: The Installer shall carefully lower the drop pipe, taking care not to drag the power cable over the casing or allow the cable to become pinched. After the drop pipe and cable are lowered into the well, the Installer shall check continuity and resistance with an ohmmeter do determine if damage to the cable has occurred or if a short or ground exists.

c. Check Valves: Average spacing shall be 100-feet (not equally spaced), and a check valve shall be installed one length of drop pipe above the pump.

d. Centering Guides: Install one centering guide on each length of plastic drop pipe.

e. Torque Arrestor: If plastic drop pipe is used a minimum of three torque arrestors shall be installed. Place one immediately above the pump, one 10-foot above the pump and another 20-foot above the pump.

f. Pitless Adapter: The outside section of the adapter shall connect onto the well casing below the frost line. The adapter shall be connected to the casing by clamp-and-gasket or by welding. The casing shall extend above the ground a minimum of 12-inches. The Installer shall cut a hole in the casing for the horizontal discharge line or adapter.

g. Pitless Unit: The Installer shall cut off or remove the upper part of the casing and connect the outside of the pitless unit directly to the casing.

h. Sanitary Well Seal: The well seal shall be fitted securely on the well casing and adjusted to insure a good seal and prevent pollutants from entering the well. Special attention shall be given to the installation of the seal to provide a suitable anchor for the suspension of the drop pipe and power cable.

- i. Concrete Pad: When required, a 4-inch thick concrete pad shall be constructed that extends laterally outward from the well casing at least 2-feet in all directions. A minimum 6-inch layer of sand is required between the bottom of the concrete base and subgrade when the subgrade is a high clay soil subject to shrinking and swelling with wetting and drying. The concrete base shall be separated from the well casing by a plastic or mastic coating or sleeve to prevent bonding of the base to the casing and be sloped to drain away from the well. The concrete shall be finished with a smooth wood float and allowed to cure a minimum of 24-hours before pump installation. The top of the casing shall extend a minimum of 12-inches above the land surface (or 8-inches above the base). Concrete shall be in accordance with the above Item 3c. (10).
- j. Pump Controls: Install, connect, and adjust controls to operate the submersible pump according to the manufacturer's recommendations.
- k. Flow Testing: After installation is completed, the Installer shall operate the pump, at design capacity for a period of at least 2-hours. If the power source is not available, the Installer shall supply a compatible power source, at their expense, for the required testing. The Installer shall also provide water storage facilities and temporary lines, if none are present at the site, for the safe discharge of the test water.
- l. Insulation Testing: After installation, the Installer will test insulation resistance between windings, and between each stator winding and frame. Insulation values less than 1/2-megohm are not acceptable.
- m. Motor Current Testing: The Installer will measure the motor current in each phase conductor with the motor operating at the highest normal load to which it may be subjected, and compare current readings to the nameplate full-load-current ratings. The Installer will report to USDA-NRCS readings higher than the nameplate rating.
- n. Sanitary Protection of Well: The Installer shall protect the well during the construction period to prevent vandalism, tampering, or seepage of contaminated water, petroleum products, or other contaminants into the well from the ground surface.
- o. Correcting Contamination: If the well becomes contaminated, or water with undesirable physical or chemical characteristics enters the well due to the neglect of the Installer, corrective work including the supplying of seals, sterilizing agents, or other materials as may be needed to prevent contamination of the aquifers shall be performed at the Installer's expense.

5. ***CERTIFICATION***

The Installer shall furnish the owner/operator a written certification (with a copy provided to USDA-NRCS) that the electric submersible pump, motor, equipment accessories and installation conform to the requirements of this specification and to the Texas Administrative Code; Title 16 Economic Regulation; Part 4 Texas Department of Licensing and Regulation (TDLR); Chapter 76 Water Well Drillers and Water Well Pump Installers Administrative Rules, <http://www.license.state.tx.us/wwd/wwdrules.htm>.

The certification shall also provide the name of the pump unit manufacturer, its model and serial number, and the horsepower of the pump. The Installer shall also certify that they are licensed by the State of Texas as a pump installer. The Installer shall provide a copy of the manufacturer's pump curve, ratings, and other operating data to document that the pump will meet the livestock water requirements at the total head and operating requirements specified on the design.

6. GUARANTEE

The Installer shall provide the owner/operator a guarantee (with a copy provided to USDA-NRCS) that covers all equipment, materials and installation against any defective materials or workmanship, for a period of one year from the date of completion. If any equipment, materials or workmanship prove to be defective within one year, they shall be replaced or repaired by the Installer.

7. MEASUREMENT

Measurement of each pump installation will be on a completed job basis. An onsite check of the completed pump installation will be performed by a USDA-NRCS representative.

8. CONSTRUCTION DETAILS

<p><u>This construction specification, attached construction details and the requirement for completion of a TX-ENG-80, UTILITIES INVENTORY have been reviewed with me and I agree to install my electric submersible pumping unit according to these construction specifications.</u></p>	
<p>_____</p>	<p>_____</p>
Owner/Operator	Date