SPECIFICATIONS - DETAILED PROVISIONS
Section 11937 - Deep Well Vertical Pumps

C O N T E N T S

ATTACHMENT

SECTION 11937
DEEP WELL VERTICAL PUMPS

PART 1 - GENERAL

1.01 GENERAL

This Specification is for close-coupled deep well vertical turbine pumps including discharge head, column and tube enclosed line-shaft assembly, strainer and oil lubrication system. All equipment furnished under this section shall be new and of current manufacture and shall be guaranteed free from defects in material, design, or workmanship. All parts of the pump exposed to water shall be of stainless steel, brass, heavy cast iron, or equivalent corrosion-proof material. Unless otherwise specified herein, all applicable provisions of ANSI/AWWA E-101, Part A, latest edition, for Vertical Turbine Pumps, are hereby made a part of these Specifications. The pumps shall be manufactured by Peerless, Goulds, Floway or District approved equal.

Refer to the Detailed Well Pump Specification section and the Special Conditions for additional requirements/information.

1.02 UNIT RESPONSIBILITY

All combinations of manufactured equipment which are approved under this specification shall be entirely compatible and the Contractor and the listed manufacturer shall be responsible for the compatible and successful operation of the various components of the units conforming to the specified requirements. All necessary mountings, couplings, and appurtenances shall be included with each unit. All materials employed in the pump equipment shall be suitable for the intended application and shall be high grade commercial quality, free from all defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended.

Motors shall be the "hollowshaft" type with a non-reversing ratchet and shall meet the requirements of Section 16150 and Section 16151. Should the equipment selected by the Contractor require revisions to the structures, piping, electrical, or other work shown on the drawings, the Contractor shall include the cost of such revisions in his bid for the equipment, and no extra payment shall be made for such revisions. All such revisions shall be submitted for District approval, and shall be subject to the approval of the Engineer.

1.03 SUBMITTALS

Submittals shall be provided to the Engineer for approval prior to beginning manufacture/construction of the pumping units in accordance with the General Conditions. Submittals shall include:

A. Shop Drawings including the following information:

1. Pump name and identification number.

2. Pumping unit outline diagrams.

3. Pump detailed description and specification.

4. Electrical data including control and wiring diagrams.

5. Assembly and installation drawings including shaft size, coupling anchor bolt plan, part nomenclature, materials list, outline, dimensions, and shipping weight.

B. Certified pump curves showing head versus capacity, bowl efficiency versus capacity; NPSH and BHP requirements, and thrust and moment of inertia characteristics. Each curve shall be continuous over the full operating range from zero (0) flow up to the maximum flow permissible through each pump, and shall be based upon the RPM listed. Each curve shall state the RPM speed of the pumping unit, and shall be furnished full-size on 8-1/2" x 11" paper. The Contractor shall provide pumps capable of meeting all aspects of the Detailed Well Pump Specification section and as shown on the Drawings.

C. Operation & Maintenance Manuals. Sets of printed instructions relating to proper maintenance and parts lists indicating the various parts by name, number and diagram where necessary shall be furnished in duplicate with each unit or set of identical units as required by the General and/or Special Conditions. Recommended spare parts lists shall be included and local supplier's name where spare parts are available.

1.04 OPERATING CONDITIONS

The capacities, heads, efficiencies, and horsepower requirements are for completely assembled units and are specified in the Detailed Pump Specification section. Each pumping unit shall meet the requirements and design points as specified therein.

PART 2 - PRODUCT

2.01 PUMP ASSEMBLY CONSTRUCTION

A. Pump Discharge Head Assembly. The pump discharge head shall be of fabricated steel or close grained, cast iron, ASTMA48 Class 30, free of sand holes and other defects, accurately machined and with a surface discharge. Discharge shall be machined and drilled to ANSI standards for 125# rating and shall be of the diameter shown on the construction drawings. The top o the discharge head shall have a rabbet fit to accurately locate the vertical hollow shaft driver, and have a diameter equal to the driver base diameter (BD).

A shaft mechanical seal assembly shall be provided; including permanent seal housing with renewable internals (faces and springs, etc.). The seal assembly shall be approved by the Engineer and shall be silicon carbide steel as manufactured by Chesterton, Model No. 155 or approved equal; and specifically selected for the fluid being pumped, and the operating pressures included.

The discharge head shall be equipped with a tube tensioning device to apply and maintain proper tension to the shaft enclosing tube. This device shall consist of a cast iron ASTM A48 Class 30 tube tension plate and bronze ASTM B584 alloy C83800 combination tube tension nut and bearing. Tension shall be applied to the shaft enclosing tube through internal threads in the top tube. After proper tensioning, nut shall be locked into position with a steel cap screw.

B. Outer Column Pipe. The outer column pipe shall be of ASTM A53 grade B steel pipe or ASTM A120 in interchangeable sections not over 20 feet in length and with the ends of each section faced parallel and machined with 8 straight threads per inch permitting the ends to butt and insuring alignment when connected by standard mill steel couplings. The weight of the column pipe shall be no less than that stated in ANSI Specification E101, Section 5.1 "Standard Specifications for Discharge Column Pipe". The column size shall be such that friction loss will not exceed 5' per 100', based on the rated capacity of the pump. If possible, the column size shall also be such as to provide a velocity of not less than 5' per second at the rated capacity.

C. Line Shaft. The top line shaft (head shaft) shall be of ASTM A108 C1045 carbon steel which shall not exceed 10' in length. Impeller adjustment shall be provided at the top of the head shaft by means of a bronze adjusting nut of ASTM B584 alloy C83800 which shall be positively locked in position.

The line shafts shall be of carbon steel ASTM A108 grade C1045, turned and ground. They shall be furnished in interchangeable sections not over (10) or (20) feet in length.

The butting faces shall be machined square to the axis of the shaft, with maximum permissible axial misalignment of the thread axis with the shaft axis 0.002" in 6". The size of the shaft shall be no less than that determined by ANSI/AWWA-E101 Specifications, Section 5.5 for C1045 line shaft and shall be such that elongation due to hydraulic thrust will not exceed the axial clearance of the impellers in the pump bowls. Maximum runout in 10' shall not exceed.005".

D. Line Shaft Bearings. The line shaft bearings shall be of bronze ASTM B505 alloy C84400, internally spiral grooved to allow lubricant to flow through and threaded externally to act as enclosing tube connectors.

E. Shaft Enclosing Tube. The shaft enclosing tube shall be of ASTM A120, Schedule 80 with the ends machined square and parallel, threaded internally to receive the line shaft bearings. Maximum tube thread runout in 5' length shall not exceed .005". Bearing spacing shall not exceed 5'.

F. Pump Bowls. The bowls shall be of close-grained, gray cast iron, ASTM A48 Class 30 or better, precision cast, free from blow holes, sand pockets, and other detrimental defects. The water passageways in said bowls shall be smooth so as to allow freedom from cavitation and permit maximum efficiency. Each bowl shall have a rubber or bronze lateral seal ring and a side seal to prevent slippage of water between bowl and impeller. In order to improve the guaranteed efficiency of the design point(s), bowls sizes 4" through 20" shall be lined. Said lining, vitreous porcelain enamel or equal, shall be of such material and applied in such manner to produce a long effective life which shall not be applied for the purpose of a short time gain in efficiency. Lining, identical to that furnished hereunder, shall have been used in the field, under identical conditions, with satisfactory results for a least a five-year period. The bowls shall be able to withstand a minimum of 150% of the maximum pump shut-off head (zero GPM) pressure or twice the pressure at rated capacity, whichever is greater. In no case shall the pressure rating of the bowl be less than 300 psi. Bowl material shall have a minimum tensile strength of 30,000 psi.

G. Pump Impellers. Impellers shall be the totally enclosed type. The impellers shall be constructed of ASTM B505 alloy C83800 and shall be statically balanced. Sizes 18" and greater shall also be dynamically balanced to prevent vibration. Impellers shall be smoothly finished on all surfaces to reduce friction losses to a minimum. The impellers shall be accurately fitted and securely locked to the pump shaft and vertical adjustment of the impellers shall be possible by means of an adjustment method in the driver assembly.

H. Impeller Lock Collets. The lock collets shall be constructed of AISIB-1113 steel or stainless steel.

I. Pump Shaft. The pump shaft shall be constructed of ASTM A582 grade 416 stainless steel and shall be accurately machined to a sufficient dimension to provide smooth operation and to easily withstand torsional loads and other stresses encountered within the pump. The pump shaft shall have adequate bearing support at every bowl section and at the top and bottom case section, and shall be equipped with a suitable steel coupling for connection to the line shaft. The shaft size shall be no less than that determined by ANSI/AWWA Specifications E101, Section A4.3 paragraph 4.3.3.

J. Pump Bearings. The suction case section and the discharge case section bearings shall be sleeve type constructed of bronze ASTM B505 alloy C84400. The bowl bearings shall be sleeve type of zinc-free bronze, or equal as approved by the engineer. Bearing area, bearing cooling, and bearing lubrication shall be ample for long trouble-free operating life of the equipment.

K. Pump Discharge Case. The discharge case shall securely fasten the top pump bowl assembly to the column piping. This section shall be heavily reinforced with streamlined fluid passages to allow release of fluids escaping through the throttle bearing and oil from the line shaft bearings. The discharge case shall also be fitted with a bronze ASTM B505 alloy C84400 tube adapter bearing of proper size to connect the shaft enclosing tube. The discharge case shall be threaded on the outside for column sizes up to 14 inches.

L. Pump Suction Case. The suction case shall be threaded on the O.D. and shall securely fasten the bottom bowl assembly to the suction bell.

M. Suction Pipe. Provide a suction pipe, attached to the bottom of the bowls, a minimum of 10 feet in length, or as otherwise shown on the construction drawings, and of a diameter and weight at least equal to the outer column.

N. Strainer. A stainless steel strainer shall be provided and attached to the suction column pipe. The inlet area shall be equal to at least four times the suction pipe area. The maximum opening size shall not be more than 75% of the minimum opening of the water passage through the bowl or impeller, whichever is smaller.

O. Thrust Caps Bearings. Upthrust loads encountered in normal service, including start-up, shall be accommodated by suitable thrust bearings in the pump and/or motor assembly.

P. Pump to Motor Coupling. The pump/hollow shaft motor coupling shall be, type 416 stainless steel and shall be capable of transmitting the total torque of the unit in either direction.

Q. Pump Nameplate. The pump shall be supplied with an easy-to-read, corrosion resistant nameplate. It shall contain complete pump information including: pump manufacturer's name, serial number, pump model number, number of stages, speed, T.D.H. and capacity in GPM at the middle design point, year manufactured, etc. Said nameplate shall be mounted on the pump head.

2.02 CHLORINATION PIPE

A 3/4" dia. dual purpose air line / chlorination pipe of 308 or 316 stainless steel pipe shall be furnished of sufficient length to extend from the surface to the top of the bowl assembly. Pipe lengths shall be a minimum of 10 feet long, threaded, and shall be joined with stainless steel couplings. The pipe shall be attached to the column assembly with 1 inch wide stainless steel hose clamps spaced a maximum of 10 feet apart. Stub-up and cap-off pipe 6" above the pump base plate.

2.03 JOINTLESS AIR LINE TUBE

A 3/8" jointless airline of soft rolled stainless steel tubing shall be furnished of sufficient length to extend from the surface to the top of the bowl assembly. The tube shall be attached to the column assembly with 1 inch wide stainless steel hose clamps spaced a maximum of 20 feet apart. Stub-up and cap-off pipe 6" above the pump base plate.

2.04 LINE SHAFT OILER ASSEMBLY

Discharge head shall be equipped with a standard aluminum, four quart lockable oil reservoir fitted with solenoid valve and sight drip oiler for lubrication of the LINE SHAFT. Solenoid valve shall have a push-button for the purpose of manual override.

PART 3 - EXECUTION

3.01 PUMPING UNIT - PUMP DEALER REQUIREMENTS

Pump supplier shall have complete office/shop facilities located within 100 miles of the job site, and shall have a 10 years minimum successful experience record for pump sales/service.

3.02 DELIVERY

The Contractor shall order the pump at the earliest possible time to allow time for the preparation, submittal, approval of shop drawings, and subsequent manufacture and installation of the pump in a timely manner.

3.03 PREPARATION

Sets of instructions for field procedures for erection, adjustments, inspection, and testing shall be provided prior to installation of the pumps, as required by the General or Special Conditions.

3.04 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.

3.05 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.

3.06 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.

3.07 CERTIFICATION OF INSTALLATION

The Contractor shall submit the attached “Manufacturer’s Certificate of Proper Installation” to the District confirming that all pumping equipment was inspected, operation checked, and installation approved in writing by the respective pumping equipment representative.

3.08 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.

3.09 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 11937

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER: _____ EQPT SERIAL NO: _____

EQUPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- ☐ Installed in accordance with Manufacturer's recommendations.
- ☐ Inspected, checked, and adjusted.
- ☐ Serviced with proper initial lubricants.
- ☐ Electrical and mechanical connections meet quality and safety standards.
- ☐ All applicable safety equipment has been properly installed.
- ☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____

Manufacturer: _____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

[PAGE LEFT INTENTIONALLY BLANK]