

SPECIFICATIONS - DETAILED PROVISIONS
Section 11936 - Vertical Turbine Pumps

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ATTACHMENT

[MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION](#)

SECTION 11936
VERTICAL TURBINE PUMPS

PART 1 - GENERAL

1.01 GENERAL

This Specification is for close-coupled vertical turbine pumps for applications in sumps or suction cans, including discharge head, column, shaft, bowl assembly, vortex suppressor, lubrication system, and, if applicable, suction can. 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 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.

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.

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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 Vertical Turbine 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 Vertical Turbine Pump Specification section. Each pumping unit shall meet the requirements and design points as specified therein.

Each pump and motor combination shall be matched to deliver at least the maximum flow rate at the rated speed without entering into the motor's service factor. Motors shall meet the requirements of Section 16150 and shall be the "hollowshaft" type.

The units shall be capable of withstanding a complete flow reversal (backspinning) without damage to the pump, motor, bowls, or line shaft.

PART 2 - PRODUCTS

2.01 PUMP CONSTRUCTION

- A. **Pump Bowls.** The bowls shall be of close-grained, gray cast iron, 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. For pumps with totally enclosed impellers, (all pumps less than 75 B.H.P.), 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), lined bowls shall be furnished. 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 outside diameter of the bowls shall be of such size to fit the suction can I.D., with proper clearances. The bowls shall be able to withstand a minimum of 1-1/2 times 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.
- B. **Pump Impellers.** Impellers for pumps less than 75 B.H.P. shall be the totally enclosed type. For applications of 75 B.H.P. or greater, impellers may be either the totally enclosed or semi-open type unless otherwise specified in the Detailed Vertical Turbine Pump Specification section. The impellers shall be of the enclosed or semi-open type, constructed of SAE 40 or 64 bronze. They shall be balanced hydraulically and dynamically to prevent vibration and 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.
- C. **Impeller Lock Collets.** The lock collets shall be constructed of AISI-1113 steel or stainless steel.
- D. **Pump Shaft.** The pump shaft shall be constructed of AISI-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.

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- E. Pump Bearings. The suction case section and the discharge case section shall be sleeve type constructed of SAE 64 bronze. 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.
- F. 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 and shall contain bearings for the pump shaft.
- G. Pump Suction Case. The suction case shall securely fasten the bottom bowl assembly to the suction bell. This section shall be heavily reinforced with streamlined fluid passages and shall contain a sleeve bearing for the pump shaft.
- H. Pump Suction Bell. A suction bell constructed of Class 30 cast iron shall be provided, with entrance vanes so designed to allow even flow of water in the pump. The suction bell shall have an inlet area of at least four times the eye area of the impeller supplied.
- I. Pipe Column Nipple. The column nipple shall be standard steel pipe and shall conform to the following diameter weight per foot table:

Nominal Size (inches)	O.D. (inches)	Weight per Foot (pounds)	Fitting
4	4.500	10.79	Threaded or flanged
6	6.625	18.97	“ “
8	8.625	28.55	“ “
10	10.750	40.48	Flanged only
12	12.750	49.58	“ “
14	14.000	54.57	“ “
16	16.000	62.58	“ “

For columns 8" in diameter and smaller, the column may be threaded. For diameters 10" and larger, the column shall be a flanged assembly. The ends of the pipe section shall be faced parallel and machined with threads and/or flanged to insure proper alignment when assembled. The exterior and interior surfaces of all column pipe shall be cleaned, primed, and lined with high build epoxy, or approved equal, with application procedures per paint and manufacturer's published instructions. The minimum thickness shall be 10 mils applied in no less than three (3) coats.

- J. Pump Discharge Head Assembly. The pump discharge head shall be of fabricated steel or close grained, cast iron, ASTM A48 Class 30. Unless specifically shown on the construction drawings, the pump supplier shall be responsible for determining the type of discharge head to be used for the given application. Cast iron discharge heads shall be 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 of 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 of silicon carbide steel 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 manufactured by Chesterton, No. 155 or approved equal; specifically selected for the fluid being pumped at shut-off head pressure.

- K. Pump Line Shaft Assembly. A line shaft shall be supplied, of ASTM A276, Type 416 material, or equal as approved by the Engineer, and shall conform to AWWA E-101, Section A4.3 and A5.5.
- L. 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.
- M. Watertight Seal. There shall be an appropriate full-face gasket installed between the suction can flange and the pump discharge head assembly to insure and provide a watertight seal.
- N. Vortex Suppressor. A stainless steel vortex suppressor, as manufactured by Peerless Pump Company or approved equal, shall be provided and attached to the suction bell of the pump in order to prevent excessive turbulence in the water as it passes from the suction inlet pipe into the suction can, down between the bowl assembly and the suction can, and into the suction bell of the pump.
- O. Thrust 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. Coupling. The pump/hollowshaft motor coupling shall be, type 416 stainless steel and shall be capable of transmitting the total torque of the unit in either direction.

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2.02 SUCTION CAN

(Applicable where required by Drawings or Special Conditions)

- A. Size. Suction cans shall be sized as shown on the Drawings unless a larger diameter or length is recommended by the pump manufacturer. As a minimum, suction cans shall be of sufficient size to accept a pump with a one inch larger diameter bowl (note this does not refer to impeller trim) and one additional stage. The can inside diameter shall be adequate to accommodate the column pipe flanges, and where applicable, provide adequate clearance for flow around flanges (i.e. tee head pumps).
- B. Materials & Fabrication. Suction cans shall be equipped with an adequately sized steel base plate, welded to top of can, designed for attachment of the pump discharge head. Suction can, including suction inlet pipe, shall be cement mortar lined by centrifugal application, in accordance with accepted manufacturing standards. Suction can coating shall be one (1) shop applied coat of damp-proof red primer (SO), refer to "Protective Coating for Water Pumping Plants," System P1, Section 09871.

2.03 PUMP REQUIREMENTS - GENERAL

- A. Pressure Gauges. Pressure gauges shall be installed on all pump discharge lines and, where applicable, on the pump suction via a port in the discharge head or suction can baseplate. The pressure gauges shall be 4" diameter and accurate to one-half percent of full-scale.
- B. Suction Can Air Release Valve (where applicable). A one (1) inch air release valve shall be installed on the discharge head or suction can baseplate for the purpose of venting accumulated air in the suction can. The valve shall be Model 50 as manufactured by APCO or approved equal.

PART 3 - EXECUTION

3.01 PUMPING UNIT - PUMP SUPPLIER 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.

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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 supplier.

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 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 11936

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER: _____ EQPT SERIAL NO: _____
EQPT 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)

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