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SECTION 22 10 00 – VERTICAL TURBIN PUMP (EFFLUENT PUMP STATION)

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SECTION 22 10 00**VERTICAL TURBIN PUMPS (EFFLUENT PUMP INSTALLATION)****PART 1 – GENERAL****1.1 DESCRIPTION**

- A. The work under this section covers placement of a vertical turbine pump, valves, Controls, fittings and associated components.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 26 Electrical

1.3 REFERENCES

- A. AWWA Specification A100 (latest revision) should be used as a guide.

1.4 QUALIFICATIONS

- A. Manufacturer – Material and equipment shall be the standard products of a manufacturer who has made them for a minimum of five years and who provides published data and performance curves.
- B. Subcontractor – A subcontractor for any part of the work must have experience on similar work and if required shall furnish the Engineer with a list of projects and the names of Owners and Engineers who are familiar with their capabilities.
- C. Testing Agencies – The individual or laboratory making the chemical analysis must be an established laboratory or groundwater geologist that is registered and experienced in this type of testing. Testing methods shall be performed in accordance with the latest approved EPA methods and quality control requirements. Laboratories shall be a State Certified Laboratory. A list of agencies and/or individuals to be used shall be submitted to the Engineer for review prior to engagement.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

- A. Upon completion of the pump station, pumphead, and associated piping, the Contractor shall also submit pressure tests and results to the Engineer.

1.6 SOURCE QUALITY CONTROL

- A. Mill Tests – A mill certificate stating the quality of metal and strength shall be furnished for the pump casing, pump bowls, and impellers.
- B. Pump Performance – Certified curves showing the capacity of the pumps at various heads, the efficiency, and the required horsepower, shall be furnished by the pump manufacturer. Lead Free Material – All pipe material, solder, and flux

shall be lead free (less than 2 percent lead in solder and flux and less than 8.0 percent in pipes and fittings).

1.7 SUBMITTALS

- A. In addition to the requirement of Section 01300, the Contractor shall also submit the following data for approval before material and equipment is ordered.
1. Manufacturer's Data – Bulletins of pump motor.
 2. Maintenance Data and Operating Instructions – A bulletin for each piece of equipment showing the lubrication and adjustment programs recommended by the manufacturer.
 3. Construction Schedule – A schedule shall be submitted detailing the depths and size of all drilling operations.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Equipment to be installed in the work shall be delivered to the site and stored in a protective container so that no damage occurs from weather, dirt, or vandals.

1.9 POWER

- A. The Contractor shall provide power for construction.

1.10 SCHEDULE

- A. Contractor shall coordinate the piping to facilitate future installation of the 4th pump. Contractor shall submit a schedule showing the start and time required for each increment of the work and shall order the material and equipment for delivery to match this schedule.

1.11 JOB CONDITIONS

- A. The Contractor shall perform his work in a manner that will cause minimum disturbance to the appearance of the area. Materials shall be stored neatly without damaging trees and shrubbery.

1.12 GUARANTEE

- A. The Contractor shall guarantee the quality of the materials, equipment, and workmanship for a period of 12 months after acceptance of the completed project. Defects discovered during that period shall be replaced by the Contractor at no cost to the Owner. The Performance Bond shall reflect this guarantee.

1.13 MEASUREMENT AND PAYMENT

- A. Payment for the piping, pump, and motor will be made at the contract lump sum for the effluent pump station". Payment will include the pump, motor, flow meter,

and accessories, well vent, controls, testing, and all piping incidental to operation and connection to the proposed effluent force main.

PART 2 – PRODUCTS

The materials used shall be the following.

2.1 PUMP

- A. Shall furnish and install, at the locations on the drawings, all pumps and accessories as herein specified and required for a complete installation. Pumps in this section shall be described in the following specifications:

All anchor bolts shall be stainless steel and shall be furnished by the contractor complete with or as required by the manufacturer of nuts and setting templates. All structural steel shall conform to ASTM "Standard Specifications for Grey Iron Castings." All parts of the mechanism shall be proportioned for all stresses which may occur during fabrication, erection, testing, and operation. Duplicate parts shall be interchangeable.

The pump manufacturers shall furnish the services of factory trained representatives, for two (2) working days each, to supervise the installation and testing of the pumps and to instruct operating personnel in their proper operation and maintenance. The pump manufacturer shall furnish one (1) complete set of packing for each pump as spare parts.

All moving exposed parts shall be provided with guards in accordance with the requirements of the State Division of Safety Standards. Guards shall be fabricated of 14-gauge steel, 1/2-13-15 expanded metal screen to provide visual inspection of moving parts without removal of the guard. Guards shall be galvanized after fabrication and shall be designed to be readily removable to facilitate maintenance of the moving parts.

Equipment nameplates shall be required for the pump and motor and shall be engraved or stamped on stainless steel and fastened to the equipment. Nameplate information shall include the manufacturer's name, serial number, model number, capability, horsepower, and other information required to adequately identify the performance and capability of the equipment.

- B. Vertical Turbine Pumps – The pumps to be installed at the effluent structure shall be a motor driven, vertical turbine pump suitable for continuous operation at a minimum of **4000 gpm @ 98 ft.** of TDH with an 885 RPM, 460v, 3 phase, 60 Hz, **150 Hp inverter duty rated, WP1 style motor.** The pump shall be manufactured by Peerless, pump model 24HXC, 3 stages. The total pumping head does not include losses in the pump which must be included when selecting the pump.
1. Discharge Column – The discharge column shall be 14" Ø in standard 10-foot lengths, carbon steel, ASTM A-53, Grade B with flanged connection and shall contain a supporting spider for the line shaft at each joint 10 feet apart. The screw coupling shall be a Class 80 Cast Iron combination

coupling and shall be integrally cast in one piece or sleeve type with drop-in or screw in bronze bearing retainer. The line shaft shall be made from stainless steel, A276-410. It shall be run in water lubricated cutlass rubber D2000, 1BF715 bearings with stainless steel sleeves spaced not over 10 feet apart. The pump motor shall be equipped with block heater. The line shaft shall be water lubricated and sufficient column shall be furnished to give the required pump bowl submergence at the operating capacity.

2. Impeller Shaft – A276-410 Stainless Steel.
 3. Bowl – Class 30 cast iron A48-30.
 4. Impeller – Bronze, B584-836.
 5. Wear Rings & Bushings – Bronze B505-836.
 6. Suction Strainer – AISI Type 304 Stainless Steel.
- C. Discharge Head – A suitable pump head of high grade cast iron ASTM A48, Class 30, shall be provided for mounting the motor and supporting the pump column, bowl, and suction pipe. The above ground outlet shall be flanged and drilled to match ANSI class 125 cast iron or 150 steel flange connections. Also, the discharge flange shall have a 1/4" NPT connection for a pressure gage. The design shall permit the drive shaft to be coupled above the stuffing box to facilitate easy removal and replacement of the driver. The cast iron stuffing box shall be of the deep bore type with a minimum of six rings of packing and a seal cage. The packing gland shall be the bronze split type and secured in place with ASTM, A193, Grade B8 stainless steel studs and silicon bronze nuts. The stuffing box bearing shall be ASTM B505, Alloy 836 bronze. The pump head shall be equipped with a sole plate as recommended for this application by the pump manufacturer.
- D. Motor – The electric motor shall conform to construction and performance with the National Electric Manufacturer's Association Standards for motors as last revised. It shall be of the squirrel cage NEMA design B, normal torque, low starting current type in vertical, weather protected frames. The motor shall have a full load nominal speed listed on the drawings or less and a brake horsepower equal to or greater than that required by the selected pump at the rated head, and not be smaller than horsepower listed on the drawings. Motor shall be inverter duty rated. Details of motor service and construction are specified in Section 26 "Electrical."
- E. Column Assembly – Column Pipe shall be furnished in interchangeable sections not over 10 feet in length and shall be connected with flanged connections. The friction loss in the column shall not exceed 5 feet per 100 feet of column, based on the rated capacity of the pump. The weight and size of the column shall be no less than required in AWWA spec E101-1. The line shafting shall be AISI stainless steel of ample size, minimum of 2.19" in diameter, to operate the pump without distortion or vibration. The shaft shall be furnished in interchangeable sections not more than 10 feet in length and shall be coupled with AISI 410 stainless steel coupling. The column assembly shall have bronze retainers retained by the

butted pipe ends. Each bearing retainer shall contain a water-lubricated, cut less rubber bearing designed for vertical turbine pump service.

- F. Pump Bowl Assembly – The pump bowl shall be of close-grained cast iron, having a minimum tensile strength of 30,000 pounds per square inch, free from blow holes, sand holes, and all other faults; accurately machined and fitted to close dimensions. Bowls are to be coated inside with a smooth vitreous enamel to reduce friction losses, corrosion and sand wear in the water passages and this gives better efficiency. Each intermediate bowl is to be constructed by using a bronze bearing and a neoprene bearing to support the impeller shaft which gives the longest possible life, based on the widest range of pump conditions. Pump shall have sufficient stages.

The bowl is to provide a side seal at the impeller skirt and in addition a resilient neoprene ring, reinforced with an imbedded steel core, is to be installed in the bowl directly below the impeller skirt. This "lateral bowl ring" is to reduce the wear of the impeller skirt. Original capacities and efficiencies are to be maintained by adjustment of the top shaft nut at the top of the motor. The impellers shall be of bronze enclosed type only accurately machined and finished, and balanced. They shall be securely fastened to the impeller shaft with a steel taper bushing. The impeller shaft shall be of stainless steel of not less than 12% chrome. The impeller shaft shall be supported by a combination of water lubricated, fluted rubber and bronze bearings. Discharge and suction cases shall both be fitted with steel sand collars. All bowl boltings shall be of stainless steel.

Strainer – The bell suction shall be fitted with a cone type galvanized steel basket strainer. The openings in the strainer shall be of proper size to exclude anything large enough to clog the impeller. The open area of the strainer shall not be less than four times the impeller eye area.

2.2 AIR RELEASE VALVE

An air release valve and vacuum release valve shall be installed as shown on the drawings and as specified below.

- A. Air Release Valve – Valve shall operate by allowing air to exit the valve at an adjustable and controlled rate until the liquid enters the chamber to raise the float at which time the valve will close. The valve shall be manufactured by Crispin, APCO, or Valmatic deep well air valve. It shall have NPT screwed inlet and outlet connection with cast iron body and top, bronze and brass trip and stainless-steel ball float.

2.3 CONTROLS

- A. Controls for the effluent pump station shall be provided via SCADA system supplier. The pump system control logic shall allow for the SCADA PLC to control automatic alternation of the pumps and level in the wet well shall be sensed by a Submersible Transducer or ultrasonic transducer as well as floats. The levels shall consist of, Off, Lead, Lag, and High Level. Float and transducer cable of adequate length shall be provided to reach the pump control panel without splicing.

2.4 PRESSURE GAUGE

- A. Shall be USG General Pressure gauge with single phosphor bronze Bourdon Tube, brass movement, drawn steel case and drawn steel friction fit beaded ring in baked enamel finish. Heavy flat glass crystal. 3-1/3-inch diameter dial with white background and black lines and figures. Maximum range 100 psi figure intervals 20 psi intermediate intervals 2 psi, 5/8-inch square brass bar socket.
- B. Gauge shall be furnished and installed complete with 1/2" stainless steel nipples, impulse dampener, needle valve and other components required for a successful operation.

2.5 PUMP PRESSURE SUSTAINING VALVE

Pressure Sustaining Valve – a 14" Pressure Sustaining Valve shall be installed on the discharge side of each vertical turbine pump. Valves shall be **CLA-Val Model 60-32/660-32** combination pump control and back pressure valve. Valves shall be flanged, ductile iron body with diaphragm seat and stainless-steel trim. A pressure gauge shall be installed upstream and downstream of the valve.

PART 3 – EXECUTION

The equipment shall be installed and placed into operation by the Contractor. This plant will supply water for public usage.

3.1 FOUNDATIONS

- A. All items of equipment that are floor mounted or rest on the floor or ground shall be installed on concrete foundations. Foundations shall be constructed of concrete, accurate in dimension and neatly hand rubbed and finished. Foundations supporting heavy equipment such as turbine pumps shall be 4,000 PSI concrete. Reinforcing shall be installed as shown and sized on the plans.

3.2 PIPING

- A. Piping, valves, and accessories shall be installed as shown on the drawings and in accordance with specifications.

3.3 EQUIPMENT

- A. Shall be installed in accordance with the manufacturer's directions and shop drawings. After installation, equipment shall be inspected by a representative of the manufacturer who shall furnish the Engineer a certificate that the equipment has been installed properly and will perform as specified.

END OF SECTION