SECTION 11210 WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Finished water pumps shall be procured directly by the Owner and shall be complete with all accessories and spare parts as will be required to produce a complete and workable installation. Contractor shall install, test and place in satisfactory operation, the pumps as shown on the plans. The Contractor shall provide all labor, supplementary material, and appurtenances for the complete installation.

1.2 SUBMITTALS

A. Shop Drawings: Comply with the provisions of Section 01330 – Submittal Procedures.

1. Schedule: Submittals shall be provided to Owner within 3 weeks from date of purchase order.
2. Pump Units: Provide manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions. Performance curves shall show capacity versus total dynamic head, NPSH required, efficiency, brake horsepower, and power input at the design condition(s) required. Performance curves shall be provided for multiple VFD setting points to demonstrate multiple conditions under which the units are to operate between the design conditions as specified.
3. Drawings: Provide detail drawings containing a complete list of equipment and materials. Drawings shall contain complete pump dimensions, wiring and schematic diagrams, and any other details needed to demonstrate that the system has been coordinated and will properly function as a unit and within the system as depicted in the Contract Documents. Drawings shall show the proposed layout and anchorage of equipment and appurtenances and will show all weights and dimensions necessary for the installation of foundations, anchor bolts, piping, and valve connections.
4. Spare Parts: A complete list shall be included of spare parts to be provided.
5. Installation Instructions: Complete installation and startup instructions, as recommended by the manufacturer, shall be provided.
6. Verification and Warranty: A statement of verification shall be provided confirming that the Contract Documents have been reviewed and the submitted pumps and equipment comply with the dimensions, performance, and material requirement specified. Manufacturer shall specifically verify that the provided pump equipment is compatible for use with variable frequency drives as specified in the Contract Documents. Any variations or exceptions proposed shall be clearly noted for review by the Engineer. A copy of the manufacturer's warranty for the provided equipment shall be included.

B. Operating and Maintenance Manuals

1. Provide one digital and six (4) complete printed copies of operating manual outlining the step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, complete parts list, and brief description of all equipment and their basic operating features. Six complete copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include simplified wiring, layout, and control diagrams of the system as

installed. The manuals should include a separate, concise, section detailing recommended routine maintenance items and procedures including lubrication and wear item replacement schedules. Digital copies of manual shall also be provided.

1.3 QUALITY ASSURANCE

A. All equipment shall be supplied by a single manufacturer including bowls, impellers, column, shafting, heads, coupling, sleeves, seals, motors, guards, and appurtenances to ensure compatibility and integrity of the individual components and the manufacturer's warranty shall cover all provided equipment.

1.4 NAMEPLATES

A. Each major item of equipment shall have the manufacturer's name, address, type or style, model, serial number, and catalog number on a plate secured to the item.

B. The nameplate for each pump shall show the capacity in gallons per minute at rated head in feet and speed in revolutions per minute.

C. The nameplate for each electric motor shall show the horsepower, speed in revolutions per minute, full load current, voltage, frequency, phases, time rating, maximum ambient temperature, insulation class code letter, and service factor.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pump equipment should be stored with protection from the weather, humidity, and temperature variations.

B. Protect all pump equipment and appurtenances from dirt, dust, and damage.

C. Comply with manufacturer's written delivery, storage, and handling instructions.

D. Pump suction cans shall be delivered to Owner with 6 weeks after submittal approval.

E. Pumps shall be delivered to Owner within 14 weeks from date of submittal approval.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: Vertical turbine pumps shall be installed as indicated on the plans. Pumps shall be deep well lineshaft type manufactured for water lubrication of the lineshaft bearings by the water being pumped and furnished with a specified driver and accessories. Pumps shall be provided with suction can with above ground suction and discharge pipe connections. The pumping unit shall be designed and manufactured in accordance with the latest hydraulic institute and AWWA specifications for lineshaft turbine pumps. Three complete pump units shall be provided, with an additional fourth suction can and cover plate provided for installation of a future pump. Pumps shall be product of Fairbanks Nijhuis, Hydroflo, or Layne/ Verti-Line.

B. Operating Conditions: The pumps shall be designed and built to operate satisfactorily with a reasonable service life, when installed in a proper turbine pump application.

1.	Service:	Potable Water
2.	Pump Quantity:	3
3.	Suction Can Quantity:	4
4.	Primary Design Point (each pump):	1,880 gpm @ 410 feet TDH
5.	Secondary Design Point (each pump):	1,480 gpm @ 480 feet TDH
6.	Minimum Shutoff Head:	630 feet
7.	Maximum Pump Speed:	1800 rpm
8.	Minimum Bowl Efficiency:	82% (at primary design point)
9.	Motor Horsepower:	250 HP & Non-Overloading on Curve
10.	Electric Supply:	480 Volt, Three Phase
11.	Pump Discharge:	10-inch (flanged)
12.	Pump Suction:	14-inch (flanged)
13.	Suction Can Diameter:	20 inch (minimum)

2.2 PUMP CONSTRUCTION

A. Discharge Head: Discharge head shall be of the high profile type and have a suitable motor base. It shall be intended for pump operation with variable frequency drives and specifically designed to elevate the discharge head natural frequency above the operating speed. The head shall allow the top shaft to couple above the mechanical seal. The head shall be threaded to accept the desired column pipe in this specification.

A drive shaft of the same material as the lineshaft shall extend through the sealing assembly of the discharge head and be coupled to a vertical solid shaft driver using a spacer type coupling to permit easy field removal of the mechanical seal. The shaft sealing assembly shall consist of a cast iron tension box, cast iron gland, bronze connector bearing, stainless steel gland nuts and bolts and cartridge-type or split-type mechanical seal.

Discharge head openings shall be fitted with guards to prevent access to the rotating shaft and/or coupling.

B. Bowl Assembly: The intermediate bowls, discharge cases and suction bowls shall be flanged type constructed from close grain cast iron, and shall conform to ASTM A48, class 30. They shall be free from sand holes, blow holes or other faults and must be accurately machined and fitted to close tolerances. The intermediate bowls shall have glass lined enamel or epoxy enamel coated waterways for maximum efficiency. All threaded discharge cases shall be threaded to an 8 TPI butt standard for product lubricated column assembly. All assembly bolting shall be stainless steel.

Impellers shall be investment cast 201 stainless steel, ASTM A296 and shall be enclosed type. They shall be free from defects and must be investment cast, machined, backfiled and balanced for optimum efficiency and performance. They shall be securely fastened to the bowl shaft with stainless steel taper locks, C1045 steel will not be accepted. The impellers shall be adjustable by means of a top shaft adjusting nut or adjustable solid shaft coupling.

Bowl shaft shall be constructed from PSQ 416 stainless steel, ASTM A582 pump shaft material. It shall be precision machined and straightened within .002 - .004 tolerance

C. Column Assembly: Intermediate column lengths and lineshaft bearing spacing shall not exceed 10 feet with pump speeds up to 2200 rpm. Column pipe shall be minimum grade B steel pipe with ends machined with 8 TPI butt thread and faced. Pipe shall be connected with threaded sleeve type ductile iron couplings and accept ¾" ring spider bearing retainers.

Spiders shall be 201 stainless steel and furnished for shaft stabilization at each column pipe coupling. A rubber fluted bearing, retained with a shoulder at each end, shall be installed in each spider.

Lineshaft shall be 416 stainless steel and sized according to the horsepower requirements of the designed pump. The butting faces shall be machined square to the axis of the shaft, with the maximum permissible axial misalignment on the thread axis with the shaft axis .002" in 6". These shafts shall be coupled with 416 stainless steel lineshaft couplings.

D. Motor: The motor shall be a heavy duty squirrel cage induction type, inverter duty rated for VFD operation, vertical hollow shaft motor shaft motor, with a non-reverse ratchet to prevent reverse rotation. A suitable thrust bearing shall be required to meet the designed pump's hydraulic thrust load plus the weight of the rotating parts under the operating conditions. The motor shall be premium efficiency with a WP-1 enclosure, a 1.15 service factor, and match the required voltage and phase at 60HZ. Motor oil shall be food grade meeting NSF standards for contact with potable water.

E. Coating: Discharge head shall be coated with two coats of high build epoxy applied at a rate to provide minimum of 6 mils dry film thickness. Finish coat shall be Carboline "191 HB" or approved equal.

F. Equipment Guards: Equipment driven by open shafts, belts, chains, or gears shall be provided with all-metal guards enclosing the drive mechanism. Guards shall be constructed of galvanized or aluminum clad steel members. Guards shall be secured in position by steel braces or straps which will permit easy removal for servicing the equipment. The guards shall comply in all respects to applicable safety codes and regulations.

G. Spare Parts and Tools: A complete set of all special tools which may be necessary for the adjustment, operation, maintenance, and disassembly of all equipment shall be furnished with the pump. Sufficient spare parts shall be provided for all manufacturer recommended maintenance to occur during the first three years of pump operation.

PART 3 - EXECUTION

3.1 WARRANTY

A. Manufacturer's Warranty: The manufacturer of the equipment shall warrant it to be of quality construction, free from defects in material and workmanship. The equipment shall be warranted for a period of 24 months, excepting only those items that are normally consumed in service. Components failing to perform as specified by the ENGINEER, or as represented by the manufacturer, or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the OWNER.

B. Effective Date: The warranty shall become effective upon the service start of equipment as designated by the OWNER and Startup Technician.

3.2 START-UP SERVICES

A. The manufacturer of the pump equipment shall provide the services of a trained, qualified representative for at least two (2) days for the purpose of inspecting the installation to assure compliance with shop drawings, pump startup, and performance verification. Each pump shall be checked for lubrication, alignment, rotation, vibration, and starting and running electrical and efficiency characteristics. The representative shall notify the Contractor and the ENGINEER of anything in the installation which might render the manufacturer's guarantee null and void. The manufacturer's representative shall also instruct the operating personnel in the proper method of operation and maintenance of the equipment.

B. After installation of the pumping units and appurtenances is complete, operating tests shall be carried out to assure that the pumping installation operates properly. The Manufacturer's representative shall be onsite for the field testing. Each pumping unit shall be given a running field test for a minimum of 2 hours. Each pump unit shall be operated at its rated capacity or such other point(s) as selected by the Engineer.

C. Pumps and motors shall be tested to meet the Hydraulic Institute specification for vibration. The pumps shall meet vibration limits prior to acceptance.

D. Following the start-up of the pumps, the manufacturer shall provide a written certification verifying that the pumps have been installed and started up property and are performing in accordance with the specifications and confirming that nothing has been done to negatively impact the equipment warranty. The certification should document field tested pump and motor performance test results including vibration, pump operating flow and head conditions, electrical, and efficiency characteristics.

3.3 INSTALLATION

A. The CONTRACTOR shall install all equipment in strict accordance with the manufacturer's recommendations. The CONTRACTOR shall supply all equipment and accessories not specifically provided by the manufacturer but required for satisfactory installation and operation.

END OF SECTION