

## SECTION 331223 – WATER UTILITY PUMPING STATIONS

### Scope:

The Contractor shall install a pump station at locations to be determined by the Owner. Pump stations are designed to deliver flow to water tanks and/or to serve as a booster station to maintain system pressures in outlying or elevated areas, as well as, provide fire flow as necessary.

### Submittals:

If the pump station is not being supplied by the Owner, a completed submittal package prepared by the pump manufacturer shall be submitted for approval by the Owner. Contractor shall also submit a written plan for approval by Owner for provisions for getting electrical power to the station and any other aspects of the work required to complete a working installation.

### Products:

- A. Pumps:** The pumps shall be end suction, centerline discharge as manufactured by Peerless, Blackmer, or equal. All pumps shall be NSF 61 approved.
- B. Casing:** The pump casing shall be made of ductile iron material. The casing is to be supported on two (2) legs made of ductile iron, to prevent misalignment of the pump casing at elevated temperatures. The suction and discharge neck will be drilled and taped with ¼” NPT connections for pressure gauges and/or auxiliary piping.
- C. Centerline Support Legs and Universal Foot:** The centerline casing support legs and bearing frame universal foot are to be slotted construction to allow for best alignment with suction and discharge piping, to minimize pipe strain, and eliminate the need for shimming. The universal foot shall be provided with jack bolt to permit vertical positioning.
- D. Shaft:** The pump shaft shall be solid 316 SS with no sleeve. Minimum shaft diameter at stuffing box face, 1.875 inches. The stiffness ratio (L3/D4) shall not exceed a value of 55 in order to establish satisfactory mechanical seal life. Minimum shaft diameter at the coupling shall be 1.375 inches.
- E. Bearings:** The thrust bearings shall be dual angular contact type, one side ground for mounting back to back. Double row filled slot bearings are not acceptable. The thrust bearing shall be locked into the cartridge by a bolted-on retainer cover to minimize the end play of the shaft and to permit a positive lock of the thrust bearing outer face. A snap ring thrust bearing retainer is not acceptable. Radial and thrust bearings shall be C3 rated clearance. Radial bearing shall be 6310 or equal, thrust bearing shall be 7310 BYG or equal.
- F. Bearing Oil Seals:** Each end of the bearing frame assembly shall incorporate non-contacting labyrinth oil seals. Lip seals are not acceptable.
- G. Bearing Frame:** The bearing frame shall be heavy duty construction cast iron with radial fins for maximum cooling. The oil sump shall contain a minimum of one (1) quart of oil to allow for more heat dissipation, better lubrication, and a cooler running element. The oil level within the bearing frame shall be monitored by an oil sight glass. The oil sight glass shall have a white color perforated background, to permit visual inspection of the condition of the oil. An oil drain plug is required at the bottom of the bearing frame. Two (2) magnetic pipe plugs shall be located near the bottom of the bearing frame.
- H. Impeller Clearance Adjustment:** The thrust bearing end of the bearing frame shall incorporate a micrometer impeller adjustment external of the thrust cartridge (a threaded

thrust cartridge is not acceptable). All adjustments must be made without the use of shims, dial indicators, or feeler gauges.

- I. C-Frame Motor Adapter:** The pump shall have a C-Frame motor adapter which permits mounting of motors up through frame size 365TS.
- J. Mechanical Seal:** The pump shall be equipped with a single cartridge type, O-Ring mounted, balanced mechanical seal. The rotating face shall be constructed of tungsten carbide and the stationary face shall be made of pure unfilled carbon. Both faces must be one piece O-Ring mounted.
- K. Nameplates:** All equipment shall be provided with stainless steel embossed nameplates mounted in easily visible locations and shall contain at least the following information.

(1) Pumps

- a. Manufacturer
- b. Model designation
- c. Maximum speed (rpm)
- d. Maximum horsepower required
- e. Bearing type and lubrication
- f. Design flow and head
- g. Net weight

(2) Motors

- a. Manufacturer
- b. Model designation
- c. Rated horsepower
- d. Electrical specifications per current NEMA standards
- e. NEMA frame designation
- f. Bearing type and lubrication
- g. Speed (rpm)
- h. Net weight
- i. Voltage and amp
- j. NEMA code
- k. Service factor

- L. Pump Motor:** The pump motors shall be as required to deliver designed flow and pressure, 120/240/460 volt 3 Phase, 1750 or 3600 rpm, C-Face, TEFC with a 1.15 Service Factor.
- M. Factory Testing:** Pumps shall be tested at the place of manufacture in accordance with the standards of the Hydraulic Institute for testing of pumps. When tested, each pump shall be driven by a certified, calibrated motor. The pump manufacturer's certified test reports on each pump shall be submitted to the Owner prior to shipment of the pumps. The certified test reports shall include the following information:

- (1) Capacity vs. head curve U.S. gallons per minute and feet
- (2) Efficiency vs. flow curve in percent
- (3) Brake horsepower vs. flow curve
- (4) Speed of rotation
- (5) Impeller size and number
- (6) Torque vs. speed

**Implementation:**

- A. Installation:** After a complete inspection of all equipment by the Owner for factory defects or transportation/handling damages, the equipment shall be installed in accordance with the manufacturer's recommendations and the installation drawings.
- B. Pump Start-Up and Operation:** The pump manufacturer shall furnish the services of a factory-trained field engineer specializing in this work to inspect and adjust the equipment after installation, to test the equipment, supervise start-up, and instruct the Owner's personnel in its proper use. The manufacturer shall also provide a minimum of two days of operator training for both operation and routine maintenance requirements for the pumps and motors.
- (1) Field Tests:
- a. The manufacturer's field engineer shall test each unit under actual operating conditions to show that each pump unit operates satisfactorily without cavitation, overheating, or overloading, and free from excessive vibration and noise throughout the complete head and capacity range at rated speed.
  - b. The Owner shall be present to observe the field tests. Written notice shall be provided to the Owner at least 10 days prior to performing any testing.
  - c. The Contractor shall make, at his expense, all necessary changes, modifications, and/or adjustments required to assure satisfactory and efficient operation.
  - d. The pump manufacturer's authorized representative shall provide a written report to the Owner noting that pumps and motors have been installed in accordance with manufacturer's recommendations, are in conformance with project performance requirements, and are ready for operation.
- (2) Warranty: The pump shaft shall be guaranteed against breakage and/or fretting corrosion on the functional areas under the labyrinth seals and mechanical seal. The guarantee shall be for a period of ten (10) years from the start-up date. The bearings shall be guaranteed for a period of five (5) years from the start-up date. The mechanical seal shall be guaranteed for a period of two (2) years from the start-up date.
- C. Pump House Installation:** The Contractor shall construct the pump houses as detailed in the drawings. The Contractor shall also be responsible for all plumbing, electrical service, and pump tie-ins for the pump house required by the Owner. The header piping for the pump house shall be field constructed of standard flanged ductile iron pipe and fittings any small diameter piping shall be constructed of no-lead brass, copper, or stainless steel. Any welding or soldering in place must be performed with NSF 61 approved materials.
- D. Additional Pump Station Requirements:** Pump stations shall include an underground electrical service entrance. Each pump station shall have a main disconnect switch and a breaker starter combo for each pump. Two inch conduit shall be provided in the pump station foundation from the breaker starter combo to each pump. The Contractor shall install a ¾" diameter copper service from the inlet and outlet main to the pump house. The services should include a cutoff, snubber, and a 0 to 200 psi gauge for monitoring and should be securely attached to the inlet and outlet piping for support of the copper line.
- E. Site Preparation:** The Contractor will be responsible for clearing and grubbing the selected site as necessary to prepare the site for installation of the pump station.

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- F. Road / Access:** The Contractor shall install a 12' wide road for access to the pump station. Backfill under roads shall be compacted to 95 percent of the maximum dry density. Roads shall comprise a 6" layer of #57 stone with a minimum of 2" of graded aggregate base applied and compacted to the surface.
- G. Receiving, Unloading and Storage:** The Contractor shall unload the pump station in accordance with the manufacturer's recommendations. Immediately upon receipt, the Contractor shall inspect the pump station to ensure that all parts and components have been received in good condition. The Contractor shall store the pump station in accordance with manufacturer's recommendations. If the unit is not to be installed immediately, then the equipment should be stored in a clean, non-corrosive atmosphere and protected against loss, weather damage and foreign materials such as dust, sand, and moisture. Indoor storage is required unless the Owner approves other storage arrangements.
- H. Foundation:** Foundations for pump stations shall be constructed on soils with a minimum bearing capacity of 1,500 pounds per square foot. Soils placed as backfill for pump station foundations shall be compacted to 95 percent of the maximum dry density. Six inches of compacted, crushed stone shall be placed beneath all foundations. A concrete foundation in accordance with the dimensions shown in the plans shall be installed in accordance with the specifications for concrete in Sections 031100, 032000, 033000.
- I. Fencing:** An 8' tall fence around the site with a 16' wide double gate at the access road with barbed wire shall be installed around the pump station in accordance with the dimensions shown in the plans. All fencing shall be done in accordance with section 323113 of the specifications.
- J. Piping and Mechanical Work:** The Contractor shall install all necessary water piping and appurtenances as shown on the Drawings to connect the pump station to the distribution system.
- K. Electrical Work:** The Contractor shall be responsible for providing all necessary conduit and wire from the electrical meter to the pump station and for making final connections at the pump station. All electrical work must be in accordance with the current National Electric Code and overseen by an electrician licensed in the state of Georgia.
- L. Instrumentation and Control Work:** The Owner will install a remote terminal unit (RTU) cabinet meeting NEMA 4x requirements at the pump station. Owner will connect pump station to a Supervisory Control and Data Acquisition System (SCADA) through a cellular modem for monitoring and operation. Where possible, pump stations shall be designed to include pressure switches and bladder tanks to minimize the run times of the pumps during periods of low water usage. At a minimum, the following input/output (I/O) points will be included as a part of the instrumentation and control package:
- |                                  |    |
|----------------------------------|----|
| (1) Pump 1 Inlet Pressure        | AI |
| (2) Pump 2 Inlet Pressure        | AI |
| (3) Pump Station Intrusion Alarm | DI |
| (4) Pump 1 Outlet Pressure       | AI |
| (5) Pump 2 Outlet Pressure       | AI |
| (6) Pump 1 Cmd                   | DO |
| (7) Pump 2 Cmd                   | DO |
| (8) Pump 1 Motor Current         | AI |
| (9) Pump 2 Motor Current         | AI |
| (10) Pump 1 Motor Temp           | AI |

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(11) Pump 2 Motor Temp	AI
(12) Pump 1 Run Status	DI
(13) Pump 2 Run Status	DI
(14) Pump 1 Run Time	SW
(15) Pump 2 Run Time	SW

**Payment:** No separate payment shall be made for the above work.

**END OF SECTION**