

PART 1 - GENERAL

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| <u>1.1 GENERAL</u> | .1 | This section contains the requirements for the supply, installation, testing and commissioning of vertical turbine well pumps and motor. |
| | .2 | This Section is to be read in conjunction with the provided process and instrumentation drawings and general arrangement drawings. |
| <u>1.2 MEASUREMENT AND PAYMENT</u> | .1 | Payment for provision of all items specified in this Section shall be by Lot Price. No separate payment will be made for work specified in the Contract Documents. All costs incurred by Contractor in meeting with the requirements of this Section shall be included in the bid price for the Work. |
| <u>1.3 SUBMITTALS</u> | .1 | Submit Shop Drawings in accordance with Section 01 33 00. |
| | .2 | Provide Operation and Maintenance (O&M) Data for incorporation in the O&M Manual as specified in Sections 01 33 00 and 01 45 00. |
| <u>1.4 COORDINATION</u> | .1 | Coordinate with other Divisions to ensure that there is no conflict with the work. |
| <u>1.5 SHIPMENT, PROTECTION, AND STORAGE</u> | .1 | Ship all equipment skid-mounted and pre-assembled, to the degree which is practicable. |

PART 2 - PRODUCTS

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| <u>2.1 DESIGN</u> | .1 | Pumps to be vertical turbine open line-shaft. |
| | .1 | Supply and install two pumps, one duty, one standby (Tag No. P-01110, P-01120). Pumps to be installed in the East Gorge Reservoir Pump Station (ERPS-01100). |
| | .1 | Maximum design flow: 68.40 m ³ /h |
| | .2 | Design Head: 65.0 m. |
| | .3 | Tag No. P-01110 and P-01120. |

2.1 DESIGN
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 - .2 Supply and install two pumps, one duty, one standby (Tag No. P-01210, P-01220). Pumps to be installed in the West Gorge Reservoir Pump Station (WRPS-01200).
 - .1 Maximum design flow: 37.8 m³/h.
 - .2 Design Head: 55 m.
 - .3 Tag No. P-01210 and P-01220.

2.2 DISCHARGE HEAD

- .1 Provide an accurately machined ASTM A48 Class 30 Cast Iron discharge head, free of blow holes, sand holes and other defects. Provide a round base, machined flat for a gasketed and bolted fit to a separate steel soleplate that can be grouted and bolted to a concrete foundation.
- .2 Incorporate a discharge elbow in the discharge head, having an above ground flanged outlet designed for through bolting and to receive an ANSI Class 125 pipe flange.
- .3 Provide the head with the Manufacturer's standard stuffing box arrangement complete with throttle bushing, cage ring, packing and provisions for discharge bleed-off into the suction channel.
- .4 Fabricate the top column shaft through the stuffing box of AISI 416 SS. Incorporate a two piece design with a coupling located between the pump and motor for ease of installation. Provide an adjusting method on the top of the headshaft to allow impeller adjustment, which also provides a positive locking device.

2.3 COLUMN ASSEMBLY

- .1 Fabricate column assembly to enable 1.2 m section splits during assembly and disassembly.
- .2 Fabricate the lineshaft of turned and polished AISI 416 Stainless steel.

2.3 COLUMN ASSEMBLY .3
(Cont'd)

Machine the butting faces square to the axis of the shaft, with the maximum permissible axial misalignment of the thread axis with the shaft axis 0.3 mm in 1,000 mm. The size of the shaft shall be no less than that determined by ASA Specification B58, Section 4.3 per Table 5.6, AISI 416 SS Lineshaft Selection, and the elongation due to hydraulic thrust will not exceed the axial clearance of the impeller in the pump bowl.

.4 Fabricate the lineshaft bearings of Buna S rubber, mounted in cast iron bearing retainers threaded into the column couplings.

.5 Fabricate the outer column of epoxy-lined steel pipe, conforming to ASA Specification B58.1, Section 5.1, Standard Specifications for Discharge Column Pipe. Size the column such that the friction loss will not exceed 5 m per 100 m, based on the rated capacity of the pump.

2.4 BOWL ASSEMBLY

.1 Fabricate the pump bowl of ASTM A48 Class 30 Cast Iron. In the upper case, provide a rubber bearing cast in bronze tube. Select series case bearings that are at least two times the shaft diameter in length.

.2 Provide enclosed, statically and dynamically balanced impellers, fabricated of Bronze ASTM B584-C83600. Securely fasten impellers to the shaft with taper bushings, lock nuts, or keys. Provide an external means of vertical adjustment.

.3 Make impeller skirt and series case throat area thick enough to allow for machining and wear ring at time of repair.

.4 Fabricate the pump shaft of AISI Type 416 stainless steel, turned and ground. Support by bronze bearings above and below each impeller. Select top and bottom bearings with a length that is a minimum of three times the shaft diameter. Select shaft not less than 25 mm in diameter.

2.5 MOTOR

.1 Provide totally enclosed fan cooled motor, suitable for outdoor installation, vertical hollow shaft with non-reverse ratchet.

2.6 FINISHES

- .1 Finish the pump bowl, column and discharge head in accordance with Section 43 90 10 and Section 43 90 20.

2.7 CONTROL PANEL

- .1 Local control panels are to be included in the Vendor Packages, as indicated on Drawings.
- .2 Provide NEMA 4x 316 stainless steel enclosure for indoor duty, for each pump system as noted on Bid drawings. Panels shall be in conformance with the requirements of Division 26.

2.8 SPARE PARTS

- .1 Provide one (1) of each of the following spare parts:
 - .1 Packing
 - .2 Column Rubber Bearing
 - .3 Bottom Case Bearing
 - .4 Pump Shaft
 - .5 Series Case Bearing
 - .6 Impeller Lock Collet
 - .7 Top Case Bearing

PART 3 - EXECUTION

3.1 MANUFACTURER'S REPRESENTATIVE

- .1 Manufacturer's Representative shall be required to attend the site to instruct the Contractor, witness the installation and supervise testing, to ensure the equipment is installed and operated as intended, and train Site Operations staff designated by the Departmental Representative.
- .2 Duties of the Manufacturer's Representative include, but are not limited to the following:
 - .1 Installation Training: Instruct the Contractor in the methods and precautions to be followed in the installation of the pump. Attest to the Contractor's understanding of installation requirements required by Form 101 in Appendix Q.
 - .2 Installation: Ensure that the pump is installed as required to provide satisfactory service. Cooperate with the Contractor as documented by Form 102 in Appendix Q.

3.1 MANUFACTURER'S
REPRESENTATIVE
(Cont'd)

- .2 (Cont'd)
- .3 Testing: Support the Contractor to ensure and verify that the pump, including all component parts, operates as intended. Cooperate with the Contractor to fulfill the requirements for satisfactory performance of the equipment as documented by Form 103 in Appendix Q.
- .4 Commissioning: Attend the commissioning of the process system which includes the pump specified in this section to ensure that the pump functions as intended in the process system.
- .3 Factory Acceptance Testing:
 - .1 Prior to shipping, conduct factory performance testing. The testing shall include the complete pump assembly, including pump, variable speed drive and motor.
 - .2 Arrange and pay for Departmental Representative to witness factory testing.
 - .3 Prepare and submit to the Departmental Representative for review a report showing all test results.

3.2 FACTORY
ACCEPTANCE TESTING

- .1 Prior to shipping, ensure that factory performance testing is carried out and that the equipment meets the specified requirements.
- .2 Ensure that witnessing of factory testing by Departmental Representative is arranged well in advance.

3.3 INSTALLATION

- .1 Ensure that the pump is installed as required to provide satisfactory service. Coordinate work with all affected disciplines.
- .2 Complete and submit documentation in accordance with Form 102 in Appendix Q.

3.4 TESTING

- .1 Ensure that the pump, including all component parts, operates as intended.
- .2 Fulfill the requirements for satisfactory performance of the equipment as documented by Form 103 in Appendix Q.

3.5 COMMISSIONING .1 Commission the pumps specified in this section to ensure that the pump functions as intended in the process system.

3.6 TRAINING .1 Train Site Operations staff designated by the Departmental Representative in the operation and maintenance of the equipment.

 .2 Use a complete set of draft operations and maintenance manuals for the equipment as part of training instruction materials.