

**SECTION 44 42 56.03  
VERTICAL TURBINE PUMP**

**PART 1 GENERAL**

**1.01 REFERENCES**

- A. The following is a list of standards which may be referenced in this section:
1. American Iron and Steel Institute (AISI): Type 1045 Carbon Steel.
  2. American Water Works Association (AWWA): E101, Vertical Turbine Pumps-Line Shaft and Submersible Types.
  3. ASTM International (ASTM):
    - a. A48, Standard Specification for Gray Iron Castings.
    - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - c. A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
    - d. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
    - e. B148, Standard Specification for Aluminum-Bronze Sand Castings.
    - f. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
  4. Institute of Electrical and Electronics Engineers (IEEE): 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
  5. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.

**1.02 DEFINITIONS**

- A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards and of AWWA E101, American National Standard for Vertical Turbine Pumps.

**1.03 SUBMITTALS**

- A. Action Submittals:
1. Make, model, weight, and horsepower of each equipment assembly.
  2. Certification that Contractor has read and is in compliance with JEA Standard Specification for Rotating Machinery Acceptance.
  3. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

4. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the impeller trim, head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
5. Pump maximum downthrust or upthrust in pounds.
6. Detailed Shop Drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.
7. Power and control wiring diagrams, including terminals and numbers.
8. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications.
9. Factory finish system and color chart.
10. The pump manufacturer shall provide a signed letter certifying that the column pipe and line shafting have been supplied by the pump manufacturer.
11. The Contractor shall submit the results of the field measurements of the well casing flange as described in paragraph 3.02.A.
12. The pump manufacturer shall submit a statement confirming that there are no critical speeds in the operating range of the pump and motor.

B. Informational Submittals:

1. Performance Test Reports.
2. Manufacturer's Certification of Compliance that the factory finish system is identical to the requirements specified herein.
3. Special shipping, storage and protection, and handling instructions.
4. Manufacturer's printed installation instructions.
5. The Contractor's proposal to conduct the field performance tests, obtain measurements and the qualifications of the personnel that will be performing the tests.
6. Manufacturer's Certificate of Proper Installation.
7. Suggested spare parts list to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
8. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
9. Operation and Maintenance Data: As specified Section 01 78 23, Operating and Maintenance Data.
10. Procedure for conducting the functional and performance testing.

**PART 2 PRODUCTS**

## 2.01 GENERAL

- A. Augmentation well pump shall be vertical line shaft turbine type with an electric vertical hollow shaft motor, operating at a nominal 1,800 rpm. The pump shall be water lubricated type suitable for raw water service in a vertical groundwater well. The pump and well water will be initially disinfected by chlorination after installation in accordance with AWWA Standards, and periodically thereafter.
- B. All materials and coatings used in the manufacture shall conform to NSF 61 as required by the Florida Department of Environmental Protection, Chapter 62-555 Permitting, Construction, Operation and Maintenance of Public Water Systems.
- C. Operating conditions and required flow and pressure performance requirements are provided in the attached Pump Data Sheet.
- D. For unit responsibility, the pump manufacturer shall be responsible for supplying the bowl assembly, column, lineshaft, discharge head, wellhead companion flange and motor. No exception will be allowed to this requirement unless an item is furnished by the Owner.
- E. Final selection of the pump performance point has not been completed at the time of Bid. Refer to the attached pump and motor data sheets for assumptions to select a pump, column, discharge head and motor to provide a bid price.
- F. Acceptable Manufacturers:
  - 1. Goulds Pumps.
  - 2. Peerless Pump.
  - 3. National Pump Company.
  - 4. American Marsh.

## 2.02 PUMP, MOTOR, AND ACCESSORIES

- A. Discharge Head:
  - 1. The discharge head shall be made of high-grade cast iron, ASTM A48 Class 30. A fabricated steel discharge head will be allowed provided that (1) access to the wellhead is maintained as shown on the wellhead flange and access port arrangement detail in the Drawings and (2) the manufacturer can demonstrate that the discharge head, well companion flange, and motor are stiffened sufficiently to ensure that there no critical speeds in the operating range of the pump.

2. The discharge head shall be manufactured and provided by the pump manufacturer. The outlet shall be abovegrade, flanged, and sized to meet the flanged discharge piping diameter as listed in the operating conditions.
3. A Type 316 stainless steel nameplate with the pump serial number, pump model number, operating conditions, bowl data and impeller data stamped into it shall be attached to the head with noncorrosive fasteners.
4. The stuffing box shall be made of cast iron with Type 316 stainless steel split-type packing gland, studs, and nuts, and furnished with five rings of graphited synthetic fiber packing. The bearing shall be bronze, Type C89835 or equal. A rubber slinger shall be furnished with the stuffing box for securing to the shaft above the packing gland to protect the motor from excess spray. The head shall have a threaded connection in the stuffing box location for connecting a drain pipe.
5. Discharge head base shall be provided with an appropriate wellhead companion flange, see mechanical detail Wellhead Flange and Access Port Arrangement in the Drawings. The wellhead companion flange shall be threaded for the column pipe diameter as listed in the operating conditions.
6. Discharge head shall be configured to allow for direct attachment to the wellhead flange and access port assembly (shown on the process mechanical details) with a watertight gasketed connection.
7. Discharge head baseplate shall be equipped with bolt holes which match the diameter, number, and placement of the wellhead companion flange and access port assembly. The spool piece between the well casing and discharge head shall be ASTM A53 carbon steel Schedule 40.
8. The pump shall be furnished with a two-piece top shaft. The head shaft passing through the stuffing box shall be made of Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms. Its length shall be sized to accommodate the length of top column pipe plus the height of the head through the stuffing box, so that the couplings are easily accessible at the head and the first column pipe joint.

B. Column Assembly:

1. Column pipe shall be furnished in sections not exceeding a nominal 10 feet, connected by threaded sleeve coupling, of nominal diameter listed in the operating conditions supplement.
2. The top and bottom sections shall not be more than 5 feet in length.
3. Column shall be manufactured of ASTM A53 Grade B steel pipe, Schedule 40 (Standard) for nominal diameters 10 inches and less.
4. The column pipe ends shall be threaded, 8 threads per inch with 3/16-inch taper per foot thread and faced parallel to butt against the centering spiders so the assembled sections are accurately aligned.

5. Lineshaft shall be made of Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms. Each shaft length shall be straight, not exceeding 0.005 inch out in total indicator reading per 10-foot section.
6. Lineshaft diameter shall be a minimum 1-3/16-inch.
7. Lineshaft shall be furnished with a stainless steel coupling for section of shaft. Couplings shall be machined from solid stainless steel bar and have left hand threads that will tighten during pump operation. The threads of the lineshaft and coupling shall be compatible. Couplings shall be Type 410 stainless steel.
8. Bearing retainers (spiders) shall be furnished for each column and shaft section. The spiders shall be made of Type 304 or 316 stainless steel or ASTM C95800 Nickel Aluminum Bronze and designed to drop in the column couplings and be retained by the butted ends of the column pipe.
9. Shaft bearings shall be a cutlass neoprene rubber retained in the spider by a shoulder on each end of the bearing, designed for water lubricated operation with the appropriate shaft diameter.
10. The pump manufacturer shall provide a signed letter certifying that the column pipe and line shafting have been supplied by the pump manufacturer. Column and line shafting provided by suppliers or contractors other than the pump manufacturer will not be acceptable.

C. Pump Construction:

1. Bowl assembly shall consist of flanged type bowls constructed of close grained cast iron conforming to ASTM A48 Class 30. The bowls shall be free of blow holes, sand holes, or other faults and accurately machined and fitted to close tolerances, and capable of meeting or exceeding the hydrostatic pressure ratings of the Hydraulic Institute.
2. The intermediate bowls shall have enamel lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability. A discharge bowl shall be sized and threaded to connect the bowl assembly to the discharge column.
3. The discharge bowl and all intermediate bowls shall be fitted with Vesconite HiLube composite sleeve bearings by VescoPlastics.
4. The suction bowl shall be provided with nonsoluble grease packed bronze bearing. A bronze sand collar shall be provided to protect this bearing from abrasives in the pumping fluids. The bearing housing shall have sufficient opening at the bottom for easy removal of the bearing.
5. The bowls shall be assembled using all Type 316 stainless steel bolting.
6. A stainless steel nameplate with the operating conditions and bowl and impeller date stamped into it shall be attached to the bowl with noncorrosive fasteners. An additional stainless steel nameplate shall be furnished loose for use by JEA.

7. Impellers shall be constructed of either Type 304 stainless steel or ASTM C95500 Nickel Aluminum Bronze. No silicone bronze alloy impellers shall be allowed.
  8. Impellers shall be free from defects and accurately cast, machined, filed, and polished for premium efficiency and minimum vibration. Impellers shall be balanced to grade G6.3 of ISO 1940 as a minimum.
  9. Impellers shall be secured to the bowl shaft with tapered split Type 316 stainless steel bushing (collets).
  10. The bowl shaft shall be constructed from Type 416 stainless steel meeting ASTM 582. It shall be precision ground, balanced, and polished with a surface finish better than 40 rms.
  11. The pump shall be tested by the factory after trimming and assembly and a curve of the operating conditions including flow, head, efficiency, and horsepower shall be plotted and submitted to the Engineer for approval prior to shipping any materials. The test shall be a nonwitnessed test, but JEA reserves the right to reject the test and witness any retesting at its own cost.
- D. Suction Bowl Strainer: A suction strainer shall be furnished with the pump assembly. It shall be made of Type 316, or 316L stainless steel and threaded to the suction bowl. The cone strainer shall have a free area of at least four times the flow area of the suction pipe.
- E. Pump Motor: Refer to Specification 26 20 00, Low Voltage AC Induction Motors as detailed in the Drawings.

## 2.03 FACTORY FINISHING

- A. Discharge Head (Interior and Exterior), Pump Bowl (Interior and Exterior) and Suction Bell (Interior and Exterior).
1. Surface preparation SP5 White Metal Blast Cleaning.
  2. Manufacturer's standard NSF 61 certified fusion bonded coating.
- B. Column Pipe, Interior and Exterior: Do not provide coating on column pipe.
- C. Wellhead Flange and Access Port Arrangement Assembly, Interior and Exterior.
1. Surface preparation SP5 White Metal Blast Cleaning.
  2. Polyamidoamine Epoxy, Tnemec Series N141 applied at 2 coats at 4.0 to 6.0 MDFT per coat.

## D. Motor.

1. Surface preparation SP10 Near-White Metal Blast Cleaning.
2. Polyamide High Build Epoxy. Two coats at 4.0 to 6.0 MDFT per coat.
3. Top Coat: Aliphatic Acrylic Polyurethane, Tnemec Series 1095 applied at 2.5 to 5.0 MDFT.
4. Finish Color: Submit color chart for Owner selection.
5. Provide a sufficient quantity of the top coat paint for field touchup.

## 2.04 SOURCE QUALITY CONTROL

- A. Factory Testing: Certified factory tests of pumping unit will be required. The factory test of the pumping unit shall produce at a minimum the following information:
1. HQ curve.
  2. Impeller trim diameter.
  3. Shaft brake horsepower curve.
  4. Water to water efficiency (pump efficiency).
- B. Factory Test Report: Include test data sheets, curve test results, performance test logs, certified correct by a registered professional engineer or factory test facility manager.

**PART 3 EXECUTION**

## 3.01 INSTALLATION

- A. Install in accordance with manufacturer's field services technicians instructions.
- B. Connect suction and discharge piping without imposing strain to pump flanges.
- C. Orient discharge head to accurately mate with discharge piping
- D. Anchor Bolts: Accurately place using equipment templates. Use new neoprene flange gasket.

3.02 FIELD QUALITY CONTROL

- A. Confirm Well Casing Flange with Pump Manufacturer: The Contractor shall conduct field tests to confirm the well casing flange is level and plumb and meets the requirements of the pump manufacturer within 20 days from NTP. The precision of the field measurements to determine the well casing flange level shall be as recommended by the pump manufacturer.
  - 1. If the well casing flange does not meet the pump manufacturer's requirements, perform the following:
    - a. Notify the Engineer and Owner immediately.
    - b. Submit modifications to the Wellhead Flange and Access Port Arrangement Assembly to compensate for the well casing flange level to provide a sufficiently level base for the pump discharge head.
  - 2. If the well casing flange meets the pump manufacturer's requirements, submit a confirming statement with the pump Shop Drawing.
- B. Field Testing: After installation of the pump is completed, except for final connection to the water transmission line, the entire assembly will be subject to field testing. Field testing will be performed to verify mechanical performance and stated guaranteed efficiencies of the pump.
- C. The installation contractor shall install the pump in accordance with the manufacturer's field services technician's instructions. The manufacturer's field service technician shall be present during the entire time the pump is installation and subsequent performance testing.
- D. The Contractor shall submit for review and approval, the means by which it is proposed to conduct the tests, obtain measurements and the qualifications of the personnel that will be performing the tests.
- E. The field functional and performance tests shall be witnessed by the Engineer and Owner.
- F. The initial test will be performed at the expense of the Installing Contractor. Test results shall be submitted to the Engineer for review.
- G. Test results shall be submitted to the Engineer for review. Should field test results reveal inefficiencies less than the Guaranteed Efficiency the Contractor shall be assessed damages or the equipment will be rejected and replaced at the Contractor's expense. All costs for manufacturer's services shall be borne by the Contractor.



- H. Functional Test: Conduct on each pump.
1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
  2. Vibration Test:
    - a. Test with unit installed and in normal operation, and discharging to the connected piping systems at rates between low discharge head and high discharge head conditions specified.
    - b. Shall not develop vibration exceeding the limits specified in Hydraulic Institute Standards 9.6.4. The vibration measurement locations and directions shall be as shown on Figure 9.6.4.2.3.1 for a VS3 configuration.
    - c. If unit exhibits vibration in excess of limits specified, adjust or modify as necessary. Unit that cannot be adjusted or modified to conform as specified shall be replaced.
- I. Performance Test: Conduct on each pump.
1. A step test shall be conducted in the presence of the Owner and Engineer.
  2. The step test shall include a minimum of four steps.
  3. The duration of each step shall be as required to obtain steady and reliable test data. The following data shall be measured and recorded during each step of the test:
    - a. Flow Measurement: Measured by flow instrumentation.
    - b. Pressure: Owner's pressure gauge, or as approved by the Engineer.
    - c. Operating Temperature: Monitor bearing areas on pump and motor for abnormally high temperatures
    - d. Water level shall be measured by level instrumentation or Engineer approved instrumentation.
    - e. Measure phase to phase volts and amp draw at the motor control center using an ammeter provided by the Contractor.

### 3.03 FIELD FINISHING

- C. Discharge Head Assembly, Exterior.
1. As described on the Process Mechanical General Notes in the drawings, PAINTING AND PROTECTIVE COATINGS, System No 5.
  2. Finish Color: Submit color chart for Owner selection.
- D. Wellhead Flange and Access Port Arrangement Assembly, Exterior.
1. As described on the Process Mechanical General Notes, PAINTING AND PROTECTIVE COATINGS, in the drawings, System No 6.
  2. Finish Color: Submit color chart for Owner selection.

1.02 SUPPLEMENTS

A. The supplements listed below, following “END OF SECTION,” are part of this Specification.

1. Supplement 1, Nocatee Augmentation Pump Data Sheet.
2. Supplement 2, Induction Motor Data Sheet.

**END OF SECTION**

**NOCATEE AUGMENTATION PUMP DATA SHEET  
VERTICAL TURBINE PUMP**

|  |  |
|--|--|
| Project: <u>Nocatee North Reclaimed Water Re-Pump Facility Augmentation Wellhead</u> | Pump Mfr.: <u>Goulds, Peerless, National or American Marsh</u> |
| Owner: <u>JEA</u>  | Size & Type: _____   |
| Service: <u>Raw Water Well Pump</u>  | No. Stages: _____  |
| Pump Name: <u>Nocatee Augmentation Well Pump</u>                                     | Serial No.: _____  |
| Equip. Tag Number(s): <u>NXA-P-1-1-1</u>   | Model No.: _____   |

No. Pumps Required: 1

Drive Type:  Constant  Adjustable

| LIQUID  | OPERATING CONDITIONS  | SERVICE CONDITIONS   |
|---|---|--|
| Name: <u>Raw Water</u>  | Capacity (U.S. gpm):<br>Normal <u>1000</u> Rated <u>gpm</u> | Temp (°F): Max _____ Min _____   |
| Pumping Temperature (°F):<br><br>Normal <u>75</u> Max <u>85</u> Min <u>65</u> | Total Dynamic Head (ft): <u>tbd</u>                         | Rel. Hum (%): Max _____ Min _____  |
| Specific Gravity @ <u>70</u> °F: <u>1.0</u>                                   | Suction Lift (psig):<br>Max _____ Rated _____               | Altitude (ft): _____   |
| Vapor Pressure (psia): _____  | Submergence (min. ft.): _____                               | <input type="checkbox"/> Indoor <input type="checkbox"/> Heated                                |
| Viscosity (CP) @ _____ °F: _____  | NPSH Available (ft): _____                                  | <input checked="" type="checkbox"/> Outdoor <input type="checkbox"/> Unheated                  |
| pH: <u>7.6</u>  | Remarks: <u>Pump setting depth is (tbd) ft btoc</u>         | Will Pump be Submerged?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Corrosion/Erosion/Abrasion Caused by:<br><u>H<sub>2</sub>S</u>                |   | Area Classification: _____   |
| Remarks: _____  |   | Other: _____   |
| _____   |   | Remarks: _____   |
| _____   |   | _____  |

**PERFORMANCE REQUIREMENTS (manufacturer to supply missing data)**

|  |                                   |  |
|--|-----------------------------------|--|
| Proposal Curve No.: _____  | Min. Continuous Flow (gpm): _____ | NPSH Required (ft water): _____  |
| Pump Speed Range (rpm): <u>1800</u>  | Max. Head (ft): _____             | 3% Head Drop _____   |
| Efficiency (%): <u>80</u> Min _____  | Max. Power (BHP): _____           | Suction Specific Speed: _____  |
| Rated Power (BHP): _____   |                                   | Factory Testing:<br><input checked="" type="checkbox"/> Required <input type="checkbox"/> Not Required |
| <b>Remarks:</b> <u>For Bidding purposes assume a design pumping rate of 1,000 gpm, 86-inch discharge flange, 100-feet of 86-inch diameter column pipe, 100-feet of 1-3/16- inch diameter shaft, and 40-hp motor.</u> |                                   |  |

|  |                  |  |               |   |       |                 |
|--|------------------|--|---------------|---|-------|-----------------|
| Equipment Tag Number(s): <u>NXA-P-1-1-1</u>                                |                  |  |               |   |       |                 |
| <b>PUMP CONSTRUCTION DETAILS (manufacturer to supply missing data)</b>     |                  |  |               |   |       |                 |
| <b>Nozzles</b>   |                  |  |               | <b>Miscellaneous Connections</b>  |       |                 |
|  | <b>Size</b>      | <b>Rating</b>  | <b>Facing</b> | <b>Location</b>   |       | <b>Size</b>     |
|  |                  |  |               |   |       | <b>Location</b> |
| Suction  | <u>8.6</u> -inch |  |               |   | Drain |                 |
| Discharge  | <u>8.6</u> -inch |  |               |   | Vent  |                 |
|  |                  |  |               | Pres. Gauge   |       |                 |
|  |                  |  |               | Warm Up   |       |                 |
| Casing Mount:  |                  | Impeller Type:   |               | Bearings (Type/No.):  |       |                 |
| <input type="checkbox"/> Vertical  |                  | <input type="checkbox"/> Open <input checked="" type="checkbox"/> Closed |               | Bowl _____  |       |                 |
| <input type="checkbox"/> Vertical Barrel                                   |                  | Impeller Diameter (in.): _____   |               | Lineshaft _____ Pump Shaft _____  |       |                 |
| Max. Allowable Pressure (psig):  |                  | Rated _____ Max _____ Min _____  |               | Intermediate _____ Guide _____  |       |                 |
| At 60°F: _____   |                  | Max Bowl Size (in.) _____  |               | Head Shaft: _____   |       |                 |
| At Norm. Pump. Temp.: _____  |                  | No. of Stages: _____   |               | Lubrication Type:   |       |                 |
| Pump Shaft Dia. (In.): _____   |                  | Packing Mfr: _____   |               | <input type="checkbox"/> Grease <input type="checkbox"/> Oil            |       |                 |
| Column Size (In.): <u>8 in</u>   |                  | Type _____   |               | <input checked="" type="checkbox"/> Pumped Liquid                       |       |                 |
| Lineshaft Type:  |                  | Size/No. Rings _____   |               | Coupling:   |       |                 |
| <input checked="" type="checkbox"/> Open <input type="checkbox"/> Enclosed |                  | API Class Code _____   |               | Manufacturer _____  |       |                 |
| Min. Lineshaft Size (In.): <u>1-3/16</u>                                   |                  | Manufacturer _____   |               | Type _____ Model _____  |       |                 |
| Hydro Test Pressure (psig): _____  |                  | Model _____  |               | Driver Half-Coupling Mounted by:  |       |                 |
| Field Testing: <input type="checkbox"/> Not required                       |                  | Manufacturer Code _____  |               | <input type="checkbox"/> Pump Mfr. <input type="checkbox"/> Driver Mfr. |       |                 |
| <input checked="" type="checkbox"/> Required, functional and performance   |                  |  |               | <input type="checkbox"/> Purchaser                                      |       |                 |
|  |                  |  |               | Gland Type/Material: _____  |       |                 |
|  |                  |  |               | Gland Plate Taps Required:  |       |                 |
|  |                  |  |               | <input type="checkbox"/> Quench <input type="checkbox"/> Flush          |       |                 |
|  |                  |  |               | <input type="checkbox"/> Drain <input type="checkbox"/> Vent            |       |                 |

| <b>MATERIALS (manufacturer to supply missing data)</b> |                            |                     |
|--|----------------------------|---------------------|
| Bowl: _____  | Impeller: _____            | Shaft: _____        |
| Bowl Wear Rings: _____                                 | Impeller Wear Rings: _____ | Shaft Sleeve: _____ |
| Column: _____  | Bowl Bearing: _____        | Discharge Head:     |
| Remarks: _____   | Head Shaft Bearing: _____  | Type _____          |
| _____  | Lineshaft Bearing: _____   | Material _____      |
| <b>ADDITIONAL REQUIREMENTS</b>                         |                            |                     |
| Sole Plate   |                            |                     |
| Suction Strainer                                       |                            |                     |
| _____  |                            |                     |
| _____  |                            |                     |



## INDUCTION MOTOR DATA SHEET

Project: Nocatee North Reclaimed Water Re-Pump Facility Augmentation Wellhead

Owner: JEA

Equipment Name: Nocatee Augmentation Well Pump

Equipment Tag Number(s): NXA-P-1-1-1

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location:  Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 40 hp Guaranteed Minimum Efficiency at Full Load: 93.0 percent

Voltage: 460V ac Guaranteed Minimum Power Factor at Full Load: 92.0 percent

Phase: 3 Service Factor (@ rated max. amb. temp.):  1.0  1.15

Frequency: 60Hz Enclosure Type: Open weather protected - Type 1

Synchronous Speed: 1,800 rpm  Multispeed, Two-Speed: \_\_\_\_\_ / \_\_\_\_\_ rpm

Thermal Protection: T-Stat Winding:  One  Two

Space Heater: 120 volts, single-phase Mounting Type:  Horizontal  Vertical

Vertical Shaft:  Solid  Hollow

Vertical Thrust Capacity (lb): Up \_\_\_\_\_ Down \_\_\_\_\_

Adjustable Speed Drive: Part 31; NEMA MG 1

Operating Speed Range: 50 to 100% of Rated Speed

Variable Torque

Constant Torque

Special Features:

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