

SECTION 44 42 56.18
HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMPS

EQUIPMENT AND COMPONENT NUMBER(S)

PMP-2011: Grit Pump and Grit Pump Spare.

PART 1 GENERAL

1.01 SUMMARY

- A. All equipment called for under this section shall be provided by a single manufacturer.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Bearing Manufacturers' Association (ABMA).
 - 2. Hydraulic Institute Standards.
 - 3. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.
 - 4. Occupational Safety and Health Administration (OSHA).

1.03 DEFINITIONS

- A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Make, model, weight, and horsepower of each equipment assembly.
 - b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
 - c. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over entire operating range of pump from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at guarantee point.
 - d. Detailed mechanical and electrical drawings showing equipment dimensions, size, and locations of connections and weights of associated equipment. Assembly and installation drawings including shaft size, seal, coupling, bearings, anchor bolt plan,

parts nomenclature, and materials of construction lists. Baseplate drawings with leveling jackscrew details, anchor bolt and sleeve details, and minimum foundation installation and leveling requirements.

- e. Motor data, in accordance with the requirements of Section 26 20 00, Low-Voltage AC Induction Motors.
- f. Factory finish system data sheets.
- g. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

- 1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
- 2. Special shipping, storage and protection, and handling instructions.
- 3. Manufacturer's printed installation instructions.
- 4. Manufacturer's Certificate of Compliance, in accordance with Section 01 67 00, Product Requirements.
- 5. Factory Functional and Performance Test Reports and Log.
- 6. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
- 7. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
- 8. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 67 00, Product Requirements. .
- 9. Field Performance Test Reports and Log.

1.05 EXTRA MATERIALS

- A. Furnish special tools, materials, and supplies required to install, commission, and startup equipment.

PART 2 PRODUCTS

2.01 GENERAL

- A. Coordinate pump requirements with drive manufacturer and be responsible for pump and drive requirements.

2.02 SUPPLEMENTS

- A. Specific service, performance, and design requirements are attached to this section as supplements.

2.03 REPRIME PERFORMANCE

- A. Physical Characteristics: None.
- B. Functional Characteristics: None.
- C. Performance Characteristics:
 - 1. During unattended operation, the pump shall retain adequate liquid in the casing to ensure automatic repriming while operating at its rated speed in a completely open system. The need for an external suction check valve or external priming device shall not be required.
 - 2. Pump must reprime 15 vertical feet at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within 5 minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:
 - a. A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.
 - 1) A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.
 - b. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90-degree elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.
 - c. Impeller clearances shall be set as recommended in the pump service manual.
 - d. Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within 5 minutes during each cycle.
 - e. Liquid to be used for reprime test shall be water.
 - f. Upon request from the Contracting Officer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

2.04 PUMP

- A. Physical Characteristics: Horizontal, self-priming centrifugal type.
- B. Functional Characteristics: Pumps designed specifically for handling raw, unscreened, and domestic sanitary sewage.
- C. Performance Characteristics:
 - 1. Continuously rising head-capacity curve from runout to shutoff.
 - 2. Designed to operate continuously at any point on specified operating range of performance curve without cavitation, overheating, or excessive vibration.
 - 3. Motor nameplate horsepower rating not to be exceeded by pump brake horsepower required at any point on nominal pump performance curve.
 - 4. Bearing life per ABMA L-10, rated 50,000 hours.

2.05 MOTOR

- A. Physical Characteristics: Motors shall meet applicable requirements of Section 26 20 00, Low-Voltage AC Induction Motors. Also refer to Supplemental Induction Motor Data Sheets attached.
- B. Functional Characteristics: Motor horsepower shall be determined by the manufacturer and sufficient to provide pumping as specified on supplemental data sheets. Substantiation of recommended horsepower shall be provided with the Shop Drawings. Maximum horsepower is listed in the supplements to this section.
- C. Performance Characteristics: Motors shall meet applicable requirements of Section 26 20 00, Low-Voltage AC Induction Motors. Also refer to Supplemental Induction Motor Data Sheets attached.

2.06 ACCESSORIES

- A. Physical Characteristics:
 - 1. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.
 - 2. Lifting Lugs: Equipment weighing over 100 pounds.
 - 3. OSHA-approved coupling guard for direct coupled or belt driven pumps.
 - 4. Anchor Bolts: Cast in place, Type 316 stainless steel, sized by equipment manufacturer, minimum 1/2-inch diameter, and as specified in Section 05 50 00, Metal Fabrications.

- B. Functional Characteristics: None.
- C. Performance Characteristics: None.

2.07 FACTORY FINISHING

- A. Physical Characteristics: Prepare, prime, and finish coat in accordance with Section 09 90 00, Painting and Coating, System No. 4.
- B. Functional Characteristics: None.
- C. Performance Characteristics: None.

2.08 SOURCE QUALITY CONTROL

- A. Factory Tests and Adjustments: Test all equipment furnished.
- B. Factory Test Report: Include test data sheets, curve test results, certified correct by a registered professional engineer.
- C. Functional Test: Perform manufacturer's standard test on equipment.
 - 1. Dynamically balance rotating parts of each pump and its driving unit before final assembly.
- D. Performance Test:
 - 1. Conduct on each pump.
 - 2. Perform under simulated operating conditions. Include reprime performance test specified in Article General above.
 - 3. Test for a continuous 3-hour period without malfunction.
 - 4. Test Log:
 - a. Record the following:
 - 1) Total head.
 - 2) Capacity.
 - 3) Horsepower requirements.
 - 4) Flow measured by factory instrumentation and storage volumes.
 - 5) Pump discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.
 - 6) Driving motor voltage and amperage measured for each phase.
 - 5. Adjust, realign, or modify units and retest in accordance with Hydraulic Institute Standards if necessary.
- E. Motor Test: See Section 26 20 00, Low-Voltage AC Induction Motors.

- F. Hydrostatic Tests: Pump casing(s) tested at 150 percent of shutoff head. Test pressure maintained for not less than 5 minutes.
- G. Submit completed Manufacturer's Certificate of Factory Tests, including Factory Functional and Performance Test Reports and Log.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Level base by means of steel wedges (steel plates and steel shims). Wedge taper not greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for pump and driver base. Accomplish wedging so there is no change of level or springing of baseplate when anchor bolts are tightened.
- C. Adjust pump assemblies such that the driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings. Do not compensate for misalignment by use of flexible couplings.
- D. After pump and driver have been set in position, aligned, and shimmed to proper elevation, grout the space between the bottom of the baseplate and the concrete foundation with a poured, nonshrinking grout of the proper category, as specified in Section 03 62 00, Grouting. Remove wedges after grout is set and pack void with grout.
- E. Connect suction and discharge piping without imposing strain to pump flanges.
- F. Pipe pump drain(s) to hub drain or scupper.
- G. Anchor Bolts: Accurately place using equipment templates and as specified in Section 05 50 00, Metal Fabrications.

3.02 FIELD FINISHING

- A. Touchup damaged areas in accordance with and as specified in Section 09 90 00, Painting and Coating.

3.03 FIELD TESTING AND FACILITY STARTUP

- A. Field Testing and Facility Startup shall be in accordance with the requirements of Section 01 91 14, Equipment Testing and Facility Startup.

- B. Facility startup specifies the order and prerequisites for the following tests of the equipment:
 - 1. Field functional testing.
 - 2. Software operational testing.
 - 3. Performance testing.
 - 4. Demonstration testing.
- C. All Field Testing and Facility Startup shall be performed using a qualified representative provided by the Manufacturer as specified in Section 01 91 14, Equipment Testing and Facility Startup, Section 01 43 33, Manufacturers' Field Services, and as elaborated upon in this section.

3.04 FIELD QUALITY CONTROL

- A. Submit completed Manufacturer's Certificate of Proper Installation.
- B. Performance Test: Conduct on each pump as part of Facility Startup prior to successful completion of the Demonstration Testing Period.
 - 1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and excessive vibration.
 - 2. Operate pump to verify that it can self-prime as well as maintain prime after shutoff and start pumping fluid immediately upon restart as specified.
 - 3. Following validation of self-priming, test for continuous 4-hour period.
 - 4. Operate across specified range of flows, pumping the specified media.
 - 5. Record flow rate, suction pressure, discharge pressure, and motor amp draw at approximately 1/2-hour intervals and as needed to record operated over the specified range of flows.

3.05 MANUFACTURER'S FIELD SERVICES

- A. See Section 01 43 33, Manufacturer's Field Services.
- B. Training shall follow the Master Operation and Maintenance Training Schedule as specified in Section 01 91 14, Equipment Testing and Facility Startup.
- C. Manufacturer's Representative Requirements: Present at Site or classroom designated by Contracting Officer, for minimum person-days listed below, travel time excluded:
 - 1. 1 person-day for installation assistance and inspection.
 - 2. 1 person-day for functional testing and completion of Manufacturer's Certificate of Proper Installation.

3. 1 person-day for classroom or Site training. Training shall not commence until an accepted detailed training agenda, training materials, and trainer resume has been reviewed and approved by Contracting Officer.
4. 1 person-day for performance testing and facility startup.

3.06 SUPPLEMENT

A. The supplement listed below, following “End of Section,” is a part of this specification:

1. Grit Pump and Grit Pump Spare Data Sheet.

END OF SECTION

GRIT PUMP AND GRIT PUMP SPARE DATA SHEET

Tag Numbers: PMP-2011 (and a spare)

Pump Name: Grit Pump and Grit Pump Spare

Manufacturer and Model Number: (1) Gorman-Rupp Super-T, Size T3A-B-4
(2) Or equal

SERVICE CONDITIONS

Liquid Pumped (Material): Grit Slurry

Pumping Temperature (Fahrenheit) Normal: 50 Max 70 Min 40

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: 1 cp

Abrasive (Y/N) Y Possible Scale Buildup (Y/N): Y

Total suspended solids (mg/L): Less than 1,000

Min. NPSH Available (Ft. Absolute): 19

Location: Indoor (Y/N): N Outdoor (Y/N): Y

PERFORMANCE REQUIREMENTS

Rated Capacity (US gpm): 150 Secondary Capacity (US gpm): 136

Rated Total Dynamic Head (Ft): 18 Secondary Total Dynamic Head (Ft): 19

Rated Hydraulic Efficiency (%): 43

Maximum Shutoff Pressure (Ft): 25

Max. Pump Speed at Design Point (rpm): 930

Constant (Y/N): Y Adjustable (Y/N): N

PHYSICAL CHARACTERISTICS

Discharge Orientation: Vertical

Casing Materials: Gray Iron 30

Removable Cover and Inspection Plate: (Y/N) Y Material: Gray Iron 30

Impeller: Type: Semi open, 2 vane Material: Hard Iron (400 Bhn)

Replaceable Wear Plate (Y/N): Y Material: Hardened Alloy Steel

Integral Flap Valve (Y/N): Y Material: Reinforced neoprene

Shaft Material: Alloy Steel 4150 Shaft Sleeve Material: Alloy Steel 4130

Shaft Seal: Packing (Y/N): N Mechanical (Y/N) Y

Type: Oil lubricated, cartridge, double floating, self-aligning Lubrication: Oil

Seal Material: Silicon carbide rotating face, silicon carbide stationary face with fluorocarbon elastomers.

Bearing Lubrication: Oil

Baseplate: ASTM A36

Drive Type: Direct-Coupled: No Belt: Yes Adjustable Speed No

Other: Piggy back belt drive arrangement with motor mounted below the pump.
Provide optional 3-inch ASA suction and discharge spool flanges.

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors.)

Horsepower: 5 Voltage: 460 Phase: 3 Synchronous Speed (rpm): 1,200

Service Factor: 1.15 Inverter Duty (Y/N) N

Motor nameplate horsepower shall not be exceeded at any head-capacity point on the pump curve.

Enclosure: DIP EXP ODP TEFC Y CISD-TEFC TENV
WPI WPII SUBM

Mounting Type: Horizontal Y Nonreverse Ratchet (Y/N) N

REMARKS _____
