

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Separately coupled, base-mounted, end-suction centrifugal pumps.
 - 2. Separately coupled, base-mounted, double-suction centrifugal pumps.
 - 3. Closed-Coupled inline centrifugal pumps.

1.3 DEFINITIONS

- A. Buna-N: Nitrile rubber.
- B. EPT: Ethylene propylene terpolymer.

1.4 SUBMITTALS

- A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.
- B. Store pumps in dry location.
- C. Retain protective covers for flanges and protective coatings during storage.
- D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.
- E. Comply with pump manufacturer's written rigging instructions.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Mechanical Seals: Two sets of mechanical seals for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

- A. Manufacturers:
 - 1. Bell & Gossett; Div. of ITT Industries.
 - 2. Flowserve Corporation; Div. of Ingersoll-Dresser Pumps.
 - 3. Taco, Inc.
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal. Rate pump for 250-psig (1720-kPa) minimum working pressure and a continuous water temperature of 225 deg F (93 deg C).
- C. Pump Construction:
 - 1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections.

2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
 3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
 4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket.
 5. Packing Seal: Stuffing box, with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
 6. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing with grease fittings. With minimum life of 200,000hrs.
- D. Shaft Coupling: EPDM coupling sleeve for variable-speed applications.
- E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.
- F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.
- G. Motor: Variable speed, with permanently lubricated ball bearings, unless otherwise indicated; secured to mounting frame, with adjustable alignment. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- H. Nameplate shall be stainless steel, suitably secured to the pump.
- I. Capacities and Characteristics:
1. See Schedule

2.3 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

- A. Manufacturers:
1. Armstrong Pumps Inc.
 2. Bell & Gossett; Div. of ITT Industries.
 3. Thrush Company Inc.
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.
- C. Pump Construction:
1. The pumps shall be single stage end suction rear pull out design. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as called for in the plans/schedules.
 2. Pump casing shall be constructed of ASTM A48 class 30 cast iron. The pump casing/volute shall be rated for 250 psi working pressure for all jobs. The pump flanges shall be matched to suit the working pressure of the piping components on the job, with

- either ANSI Class 125 flanges or ANSI class 250 flanges. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the discharge connection to allow for the installation of a seal flush line. The pump cover shall be drilled and tapped to accommodate a seal flush line which can be connected to the corresponding tapping on the discharge connection, or to an external source to facilitate cooling and flushing of the seal faces.
3. All casings shall be flanged. Threaded casings not allowed unless extra unions and fittings are provided with that pump to allow servicing. Flanges shall comply with ASTM A105M.
 4. The pump shall have a factory installed vent/flush line to insure removal of trapped air from the casing and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.
 5. The impeller shall be ASTM B584-836/875 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.
 6. The pump shall incorporate a dry shaft design to prevent the circulating fluid from contacting the shaft. The pump shaft shall be AISI 1045 carbon steel with field replaceable bronze SAE 660 shaft sleeve. In order to improve serviceability and reduce the cost of ownership the shaft sleeve must be slip on (press on not allowable) and must be easily replaced in the field.
 7. The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250°F. This seal must be capable of being flushed externally via a tapping in the pump cover adjacent to the seal cavity. The entire pump line shall use no more than three different sizes of seals.
 8. The pump shall be close coupled to a NEMA standard JM frame motor.
 9. In order to both simplify and reduce the total cost of ownership, the manufacturer shall standardize on no more than three sizes of mechanical seals through out the entire range of the family of pumps. The manufacturer shall not use multiple part numbers for the same part.
- D. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

- A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 23 Section "Common Work Results for HVAC."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 PUMP INSTALLATION

- A. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.
- C. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.
 - 1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches (19 to 38 mm) between pump base and foundation for grouting.
 - 2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.4 ALIGNMENT

- A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.
- B. Comply with pump and coupling manufacturers' written instructions.
- C. Engage factory representative to laser align pumps in field.
- D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.
- E. Contractor to provide copy of alignment report to owner with before and after measurement readings.

3.5 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- E. Install check valve and isolation valve on discharge side of pumps.
- F. Install Y-type strainer and shutoff valve on suction side of pumps. Tie-wrap start-up strainer to strainer body when replaced with final strainer.
- G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.
- H. Install single pressure gage with multiple input selector valve.
- I. Install electrical connections for power, controls, and devices.
- J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.
 - 4. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
 - 5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
 - 6. Start motor.
 - 7. Open discharge valve slowly.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

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