

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. Section Includes:
 - 1. Separately coupled, base-mounted, end-suction centrifugal pumps.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of pump. 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.
 - 1. Submitted pump curves shall include minimum, maximum, and furnished impellar data with operating point annotated for the scheduled pump speed. Pump curve data shall include capacities, heads, efficiencies, and brake horsepower throughout the entire range of the pump.
 - 2. Include separate curve to show performance at varying speeds when pump is equipped with a variable speed drive.
 - 3. Include separate combined pump curve to show performance when pumps are operating in parallel with another pump.
- B. Shop Drawings: For each pump.
 - 1. Show pump layout and connections.
 - 2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

3. Include diagrams for power, signal, and control wiring. Differentiate between field and manufacturer installed wiring.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.
 1. Include pump curves with O&M Data
 2. Include factory and field vibration testing reports (when required) with O&M Data

1.6 QUALITY ASSURANCE

- A. Source Limitations: To the extent possible, 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. Refer to Division 01 Section "Product Requirements."
- 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.
- E. On pumps 5 HP and larger, perform factory electronic vibration analysis for both pump and motor in accordance with ANSI H11.4.6; submit report / ANSI H19.6.4 data sheets for record. Maximum allowable RMS (filter in) velocity at maximum pump motor speed, measured at each pump and motor bearing, shall not exceed 0.13 inches/sec in the vertical, horizontal, and axial directions. Pumps may also be field tested and any pump found to exceed recommended limits shall be corrected to perform within those limits without cost to the Owner.

1.7 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.

1.8 COORDINATION

- A. Coordinate size and location of concrete bases and housekeeping pads. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate wiring between pump starter/vfd and pump motor with Division 23.

1.9 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: One mechanical seal for each pump.

PART 2 - PRODUCTS

2.1 GENERAL PUMP REQUIREMENTS

- A. Provide pumps with capacities and characteristics indicated on the Drawings. Pumps shall perform to the specific duty point for which they are intended.
- B. Pumps shall be suitable for the fluid, temperature, and pressure. At a minimum, pumps shall have a rating suitable for 175 psig operating pressure and 200 F continuous water temperature.
- C. Provide ASME B16.1 flanges on pumps with suction sizes 2" and larger. Rating to suit pressure of fluid pumped.
- D. Provide motors and electrical devices in accordance with Section 220513.
- E. Pumps shall have motors that are non-overloading throughout their entire flow range.
- F. Pumps shall have a ratio of 1.15 or higher maximum impeller diameter to the selected impeller diameter.
- G. Pump / impeller combinations shall be the most efficient possible for the specified pump type. Pump efficiency shall be within 7 percentage points of the maximum efficiency on the specific impeller pump curve. The duty point shall be at a higher flow than the highest efficiency point on the curve and shall not be more than 85% of the end of curve flow.

- H. Pump suction velocities shall not exceed 13 fps; except double suction pump suction velocities shall not exceed 15 fps.
- I. Unless otherwise noted, provide internally flushed mechanical seal system with carbon face seal rotating against a ceramic face. Seal system shall be leakless and compatible with the pumped fluid type, pressure, and temperature. Seal systems for pumps handling glycol based heat transfer fluids shall be specifically rated for glycol service.
- J. Unless otherwise noted, provide heavy duty grease lubricated ball bearings with minimum L10 50,000 hour life. Grease shall be rated for 700 F minimum and resistant to water/condensation. Permanently lubricated bearing may be substituted on small pumps with motors 1.5 HP and lower.
- K. Pumps shall have statically and dynamically ballance impeller locked via key to the shaft.
- L. Factory align and test all pumps per ANSI / Hydraulic Institute recommendations and procedures.
- M. Factory paint pumps and pump assemblies with high grade machinery enamel.

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

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong Pumps Inc.
 - 2. Aurora Pump; Division of Pentair Pump Group.
 - 3. Xylem; Bell & Gossett.
 - 4. PACO Pumps.
 - 5. TACO Incorporated.
- 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.
- C. Pump Construction:
 - 1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, and drain plug at bottom and air vent at top of volute. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
 - 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw.
 - 3. Pump Shaft: Solid steel

4. Seal: Mechanical.
 5. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.
 6. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.
- D. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.
- E. 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.
- F. Motor: Secured to mounting frame, with adjustable alignment.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.3 PUMP SPECIALTY FITTINGS

- A. Suction Diffuser:
1. Angle pattern.
 2. Cast ductile-iron body and end cap, pump-inlet fitting. Pressure rating to match corresponding pump.
 3. Bronze startup and bronze or stainless-steel permanent strainers.
 4. Bronze or stainless-steel straightening vanes.
 5. Drain plug.
 6. Factory-fabricated support.

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 the 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 PUMP INSTALLATION

- A. Comply with HI 1.4
- B. Comply with HI 2.4 for vertically mounted turbine centrifugal pumps
- C. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- D. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.
- E. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.
- F. Inertia Base Equipment Mounting: Install base-mounted pumps with inertia bases on cast-in-place concrete equipment base(s) using restrained spring isolators. Comply with requirements for equipment bases specified in Division 3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC Piping and Equipment."
 - 1. Minimum Deflection: 1 inch.
 - 2. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.
 - 3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of concrete base.
 - 4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 6. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 7. Install on 4-inch- high concrete base designed to withstand, without damage to equipment, seismic force required by code.

3.3 ALIGNMENT

- A. Engage a factory-authorized service representative to perform alignment service.

- B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.
- C. Comply with pump and coupling manufacturers' written instructions.
- 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.

3.4 CONNECTIONS

- A. Comply with requirements for piping specified in Section 232213 "Steam and Condensate Heating Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to pump, allow space for 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 throttling valve with memory stop on discharge side of pumps.
- F. Install suction diffuser and shutoff valve on suction side of pumps.
- G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.
- H. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- I. Install check valve and gate or ball valve on each condensate pump unit discharge.
- J. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- K. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 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.

3.6 DEMONSTRATION

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

END OF SECTION