

CONSTRUCTION SPECIAL SPECIFICATION

SECTION 15540_S

PUMPS

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CONSTRUCTION SPECIAL SPECIFICATION**SECTION 15540_S****PUMPS****PART 1 - GENERAL****1.01 DESCRIPTION**

A. This Section includes the following categories of pumps for hydronic systems:

1. In-line circulators.
2. End-suction pumps.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following:

1. American Society of Mechanical Engineers (ASME) B31.9 "Building Services Piping" for piping materials and installation.
2. Hydraulic Institute's "Standards for Centrifugal, Rotary & Reciprocating Pumps" for pump design, manufacture, testing, and installation.
3. Underwriter's Laboratories (UL) 778 "Standard for Motor Operated Water Pumps" for construction requirements. Include UL listing and labeling.
4. National Electrical Manufacturer's Association (NEMA) MG 1 "Standard for Motors and Generators" for electric motors. Include NEMA listing and labeling.
5. National Fire Protection Association (NFPA) 70 "National Electrical Code" for electrical components and installation.

B. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Architect. The burden of proof for equality of pumps is on the proposer.

1.03 REFERENCES

A. ASME B16.1

- B. ASME B31.9
- C. American Society for Testing and Materials (ASTM) B 36
- D. ASTM B 36
- E. ASTM B 584
- F. Hydraulic Institute's "Standards for Centrifugal, Rotary & Reciprocating Pumps"
- G. Institute of Electrical and Electronic Engineers (IEEE) 112, Test Method B
- H. NEMA MG 1
- I. NFPA 70
- J. UL 778

1.04 SUBMITTALS

- A. Make submittals according to this Section, Section 15010, and Section 01300.
- B. Submit product data including certified performance curves and rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate pump's operating point on curves.
- C. Submit shop drawings showing pump layout and connections. Include setting drawings with templates, directions for installation of foundation and anchor bolts, and other anchorages.
- D. Submit wiring diagrams detailing wiring for power, signal, and control systems and differentiating between manufacturer-installed wiring and field-installed wiring.
- E. Submit maintenance data in the operation and maintenance manual as specified in Section 01300 for each type and size of specified pump.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 15010.
- B. Retain shipping flange protective covers and protective coatings during storage.
- C. Protect bearings and couplings against damage from sand, grit, and other foreign matter.
- D. Extended Storage Longer than 10 Days: Dry internal parts with hot air or vacuum-producing device. Coat internal parts with light oil, kerosene, or antifreeze after drying. Dismantle bearings and couplings; dry; coat with acid-free, heavy oil; tag; and store in dry location.

1.06 PERFORMANCE REQUIREMENTS

- A. Pump Pressure Ratings: At least equal to system's maximum operating pressure at point where installed, but not less than specified.
- B. See Drawing Schedule for additional information.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Provide products by one of the following:
 - 1. ITT Fluid Technology Corp.; Bell & Gossett Div.
 - 2. Taco Pumps, Inc.
 - 3. Aurora, Inc.

2.02 PUMPS

- A. General
 - 1. Provide factory assembled and tested units.
 - 2. Base-Mounted Pumps: Include pump casings that allow removal and replacement of impellers without disconnecting piping.
 - 3. Types, Sizes, Capacities, and Characteristics: As indicated.
 - 4. Factory Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
 - 5. Motors: Provide as specified below.
 - 6. Pump nameplates shall be located on the base of the pump. Do not insulate over pump nameplates.
 - 7. Impeller diameter to be no greater than 90% of the maximum impeller diameter, and 10% greater than the minimum impeller diameter.
 - 8. 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. In-line Circulators
 - 1. Description: Horizontal, in-line, centrifugal, single-stage, bronze-fitted, radially split case design; rated for 125-pounds-per-square-inch-gage (psig) minimum working pressure and a continuous water temperature of 225 degree (deg) Fahrenheit (F). Include the following:

- a. Casing: Cast iron, with threaded companion flanges for piping connections smaller than 2-1/2 inches (in.) and threaded gage tappings at inlet and outlet connections.
- b. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
- c. Shaft and Sleeve: Steel shaft with oil-lubricated aluminum-bronze sleeve.
- d. Seals: Mechanical type. Include carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
- e. Pump Bearings: Oil-lubricated, bronze journal and thrust type.
- f. Coupling: Close.
- g. Motor: Resiliently mounted to pump casing.
- h. Motor Bearings: Grease-lubricated roller or ball bearing type.
- i. Motor Speed: Single, unless noted otherwise.

C. End-suction Pumps

1. Description: Supported-volute, centrifugal, separately coupled, end-suction, single-stage, bronze-fitted, radially split case design; rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F. Include back-pull-out design, except where other design is indicated, and the following:
 - a. Casing: Cast iron, with flanged piping connections, drain plug in bottom of volute, and threaded gage tappings at inlet and outlet flange connections. Include integral feet or other means on volute to support weight of casing and attached piping.
 - b. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, keyed to shaft, and secured by locking cap screw.
 - c. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - d. Seals: Mechanical type. Include carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
 - e. Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment for motor sizes of 100 horsepower (hp) and less. Include flexible-spacer type, with flange and sleeve section that can be disassembled and removed without removing pump or motor, for sizes larger than 100 hp.
 - f. Coupling Guard: Steel, removable, and attached to mounting frame, in accordance with ANSI B15.1, section 8, and OSHA 11910.219.
 - g. Mounting Frame: Welded-steel frame and cross members, factory-fabricated from ASTM A 36 (ASTM A 36M) channels and angles.

Fabricate for mounting pump casing, coupling guard, and motor. Grind welds smooth before application of factory finish. Field-drill motor-mounting holes for field-installed motors.

- h. Motor: Secured to mounting frame, with adjustable alignment.
- i. Motor Speed: Single, unless noted otherwise.

2.03 VALVES

- A. See Sections 15051 and 15401.

2.04 MOTORS

A. General

1. Apply requirements below to motors covered by this Section except as otherwise indicated.
2. Motors 1 horsepower (hp) and Larger: Polyphase.
3. Motors Smaller Than 1 hp: Single-phase.
4. Frequency Rating: 60 Hz.
5. Voltage Rating: See Drawing Schedule.
6. Service factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10 percent of motor voltage rating.
7. Capacity: Minimum size as indicated, and such that they are non-overloading. If not indicated, sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.
8. Temperature Rise: Based on 40 degrees centigrade ambient except as otherwise indicated.
9. Enclosure: Open drip-proof, unless noted otherwise.
10. Motor Speed: Single, multiple, or variable as indicated.

B. Polyphase Motors

1. Squirrel-cage, induction-type, general-purpose conforming to the following requirements except as otherwise indicated.
2. NEMA Design Letter Designation: "B," unless specifically designated "C" for high starting torque.

3. Energy Efficient Motors: Nominal efficiency equal to or greater than that stated in NEMA MG 1, table 12-6C for that type and rating of motor.
 4. Variable Speed Motors for Use With Solid-State Drives: Energy efficient, squirrel-cage induction, design B units with ratings, characteristics, and features coordinated with and approved by drive manufacturer.
 5. Internal Thermal Overload Protection For Motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.
 6. Bearings: Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading of the application, unless noted otherwise.
- C. Single-Phase Motors
1. Conform to the following requirements except as otherwise indicated.
 2. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application.
 - a. Permanent Split Capacitor.
 - b. Split-Phase Start, Capacitor-Run.
 - c. Capacitor-Start, Capacitor-Run.
 3. Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.
 4. Internal Thermal Overload Protection for Motors: Protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.
 5. Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, pre-lubricated sleeve bearings may be used for other single phase motors.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect areas, equipment foundations, and conditions, with installer present, for compliance with requirements for installation and other conditions affecting performance of pumps.
- B. Inspect roughing-in for piping systems to verify actual locations of piping connections before pump installation.

- C. Inspect foundations and inertia bases for suitable conditions where pumps are to be installed.
- D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION/APPLICATION/ERECTION

- A. Install pumps according to manufacturer's written installation and alignment instructions.
- B. Install pumps in locations indicated and arranged to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support pumps and piping separately so that piping is not supported by pumps.
- D. Suspend horizontal, in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support weight of pumps. Fabricate brackets or supports as required for pumps.
- E. Suspend vertical, in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support weight of pumps.
- F. Set base-mounted pumps on concrete foundation; install on inertia base where indicated on the Drawings. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
 - 1. Support pump base plate 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 in. (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.
- G. Connections
 - 1. General: Install shutoff valve and strainer on pump suction and check valve and shutoff valve on pump discharge, except where other arrangement is indicated.
 - 2. Connect piping to pumps as indicated. Install valves that are the same size as piping connecting to pumps.
 - 3. Install suction and discharge pipe sizes equal to or greater than the diameter of pump nozzles.
 - 4. Install check valve and throttling valve on discharge side of in-line circulators.
 - 5. Install suction diffuser and shutoff valve on suction side of base-mounted pumps.
 - 6. Install triple-duty valve on discharge side of base-mounted pumps.

7. Install flexible connectors on suction and discharge sides of base-mounted pumps and where indicated. Install flexible connectors between pump casing and valves, except where other arrangement is indicated.
8. Install thermometers per Section 15135 where indicated on the Drawings.
9. Install pressure gages per Section 15135 on pump suction and discharge. Install at integral pressure gage tappings where provided.
10. Install check valve and throttling valve on the discharge side of base-mounted pumps.
11. Install electrical connections for power, controls, and devices.
12. Electrical power and control wiring and connections are specified in Division 16 Sections.

3.03 FIELD QUALITY CONTROL

- A. Check suction piping connections for tightness to avoid drawing air into pumps.
- B. Clean strainers.
- C. Set pump controls.

3.04 ADJUSTING AND CLEANING

- A. Align pump and motor shafts and piping connections after setting them on foundations, after grout has been set and foundation bolts have been tightened, and after piping connections have been made.
- B. Comply with pump and coupling manufacturers' written instructions.
- C. Adjust alignment of pump and motor shafts for angular and parallel alignment by 1 of 2 methods specified in the Hydraulic Institute's Standards for Centrifugal, Rotary & Reciprocating Pumps, "Instructions for Installation, Operation and Maintenance."
- D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Fill base plate completely with non-shrink, nonmetallic grout, with metal blocks and shims or wedges in place. After grout has cured, fully tighten foundation bolts.
- E. Alignment Tolerances: According to manufacturer's recommendations.

3.05 COMMISSIONING

- A. Provide labor, material, equipment, etc., required to facilitate the commissioning process. Perform form tests and verification procedures required by the commissioning process when requested by the Commissioning Authority and directed by the General Contractor. See Section 15995.

END OF SECTION