

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this Section.
- B. Related Sections:
  - 1. Division 23.

### 1.2 SUMMARY

- A. This Section includes the following categories of hydronic pumps and accessories for hydronic systems:
  - 1. Vertical close-coupled in-line pumps.
  - 2. Close coupled, end suction pumps.
  - 3. Flexible coupled, end suction pumps.
  - 4. Horizontal split case pumps.
  - 5. Vertical split coupled in-line pumps.

### 1.3 SUBMITTALS

- A. Product Data: Include certified performance curves and rated capacities; shipping, installed, and operating weights; 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.
- C. Maintenance Data: For pumps to include in maintenance manuals specified in Division 01.

### 1.4 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

### 1.5 QUALITY ASSURANCE

- A. UL Compliance: Fabricate and label pumps to comply with UL 778, "Motor-Operated Water Pumps," for construction requirements.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

### 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 COORDINATION

- A. Coordinate size and location of concrete housekeeping pads. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section "Cast-in-Place Concrete."

#### 1.8 WARRANTY

- A. The pumps shall be warranted by the manufacturer for a period of 18 months from date of shipment. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized on-site service.

#### 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. Pump Units: Factory assembled and tested.
- B. Motors: Include built-in, thermal-overload protection, and grease-lubricated ball bearings. Select each motor to be nonoverloading over full range of pump performance curve.
- C. Motors Indicated to Be Energy Efficient: Minimum efficiency as indicated according to IEEE 112, Test Method B. Include motors with higher efficiency than "average standard industry motors" according to IEEE 112, Test Method B, if efficiency is not indicated.

#### 2.2 VERTICAL CLOSE-COUPLED IN-LINE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Vertical Close-Coupled In-Line Pumps:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.
    - c. PACO Pumps.
    - d. Patterson Pump Co.
    - e. Peerless Pump Co.

- f. Taco; Fabricated Products Div.
  - g. Or Approved Equal
- B. Description: Vertical, in-line, centrifugal, close-coupled, single-stage, radially split case design. Include vertical-mounting, bronze-fitted design and mechanical seals rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F.
- 1. Casing: Cast iron, radially split with equal suction and discharge flange sizes, drain plug at low point of volute, and threaded gage tappings at inlet and outlet connections.
  - 2. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
  - 3. Shaft: Ground and polished stainless-steel shaft with axially split spacer coupling.
  - 4. Seals: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
  - 5. Motor: Directly mounted to pump casing and with lifting and supporting lugs in top of motor enclosure.

### 2.3 VERTICAL SPLIT COUPLED IN-LINE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Vertical Split Coupled, In-Line Pumps:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.
    - c. Or Approved Equal
- B. Description: Centrifugal, split-coupled, single-stage, bronze-fitted, radially split volute; made for vertical mounting; and rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F, with mechanical seals. Pump construction allows removal and replacement of seals without removal of pump motor.
- 1. Casing: Cast iron; with ASME B16.1, Class 125 flanged pipe connections. Include threaded gage tappings at inlet and outlet connections and threaded drain plug at low point of volute.
  - 2. Casing: Cast iron; with ASME B16.1, Class 250 flanged pipe connections. Include threaded gage tappings at inlet and outlet connections and threaded drain plug at low point of volute.
  - 3. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced.
  - 4. Shaft: Stainless-steel shaft deflection at seal limited to 0.001-inches.
  - 5. Seals: Mechanical, outside balanced type with carbon rotating face, ceramic stationary seat and Viton secondary seal.
  - 6. Coupling: Axially split, spacer type rigid coupling which permits seal maintenance without disturbing pump or motor.
  - 7. Mounting Frame: Heavy cylindrical bracket with 360° register on each flange to provide a rigid union of pump and motor. Fabricate for mounting pump casing, coupling guard, and motor.
  - 8. Motor: Open Dripproof; secured to mounting frame, with adjustable alignment.

### 2.4 CLOSE-COUPLED, END-SUCTION PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Close-Coupled, End-Suction Pumps:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.
    - c. PACO Pumps.
    - d. Peerless Pump Co.
    - e. Taco; Fabricated Products Div.
    - f. Or Approved Equal
- B. Description: Centrifugal, close-coupled, end-suction, single-stage, bronze-fitted, back-pull-out, radially split case design; rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F.
1. Casing: Cast iron, with flanged piping connections, drain plug at low point of volute, and threaded gage tapings at inlet and outlet connections.
    - a. Connection Option: Unions at connections for casings that are not available with threaded companion flanges.
  2. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, keyed to shaft, and secured by locking cap screw.
  3. Wear Rings: Replaceable, bronze casing ring.
  4. Shaft and Sleeve: Steel shaft extension with bronze sleeve and neoprene slinger.
  5. Shaft: Stainless-steel shaft close coupled to motor shaft.
  6. Seals: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
  7. Motor: Directly mounted to pump casing and with supporting legs as integral part of motor enclosure.

## 2.5 FLEXIBLE-COUPLED, END-SUCTION PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexible-Coupled, End-Suction Pumps:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.
    - c. PACO Pumps.
    - d. Peerless Pump Co.
    - e. Taco; Fabricated Products Div.
    - f. Or Approved Equal
- B. Description: Base-mounted, centrifugal, flexible-coupled, end-suction, single-stage, bronze-fitted, back-pull-out, radially split case design; rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F.
1. Casing: Cast iron, with flanged piping connections, drain plug at low point of volute, threaded gage tapings at inlet and outlet connections, and integral feet or other

means on volute to support weight of casing and attached piping. Casing shall allow removal and replacement of impeller without disconnecting piping.

2. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, keyed to shaft, and secured by locking cap screw.
3. Wear Rings: Replaceable, bronze casing ring.
4. Shaft and Sleeve: Steel shaft with bronze sleeve.
5. Seals: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
6. Coupling: Flexible-spacer type, capable of absorbing torsional vibration and shaft misalignment for motor sizes of 100 hp and smaller; with flange and sleeve section that can be disassembled and removed without removing pump or motor, for sizes larger than 100 hp.
7. Coupling Guard: Steel, removable, and attached to mounting frame.
8. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate for mounting pump casing, coupling guard, and motor. Field-drill motor-mounting holes for field-installed motors.
9. Motor: Secured to mounting frame, with adjustable alignment.

## 2.6 HORIZONTAL SPLIT CASE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Horizontal Split Case Pumps:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett ITT; Div. of ITT Fluid Technology Corp.
    - c. PACO Pumps.
    - d. Patterson Pump Co.
    - e. Peerless Pump Co.
    - f. Taco; Fabricated Products Div.
    - g. Weil Pump Company, Inc.
    - h. Or Approved Equal
- B. Description: Base-mounted, centrifugal, flexible-coupled, double-suction, single-stage, bronze-fitted, axially split case design; rated for 175-psig minimum working pressure and a continuous water temperature of 225 deg F, with mechanical seals and impeller mounted between bearings.
  1. Casing: Cast iron; with ASME B16.1, Class 125 flanged pipe connections. Include threaded gage tappings at inlet and outlet connections, vent valve at high point of volute, and threaded drain plug at low point of volute.
  2. Casing: Cast iron; with ASME B16.1, Class 250 flanged pipe connections. Include threaded gage tappings at inlet and outlet connections, vent valve at high point of volute, and threaded drain plug at low point of volute.
    - a. Casing shall allow removal and replacement of impeller without disconnecting piping.
  3. Impeller: ASTM B 584, cast bronze, statically and dynamically balanced, closed, double suction, and keyed to shaft.
  4. Wear Rings: Replaceable, bronze casing ring.
  5. Shaft and Sleeve: Stainless-steel shaft with bronze sleeve.

6. Pump Shaft Bearings: Grease-lubricated ball bearings contained in cast-iron housing.
7. Seals: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
8. Coupling: Flexible-spacer type, capable of absorbing torsional vibration and shaft misalignment for motor sizes of 100 hp and smaller; with flange and sleeve section that can be disassembled and removed without removing pump or motor, for sizes larger than 100 hp.
9. Coupling Guard: Steel, removable, and attached to mounting frame.
10. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate for mounting pump casing, coupling guard, and motor. Field-drill motor-mounting holes for field-installed motors.
11. Motor: Secured to mounting frame, with adjustable alignment.

## 2.7 PUMP SPECIALTY FITTINGS

- A. Suction Diffuser: Angle or straight pattern, 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory- or field-fabricated support.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation.
  1. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PUMP INSTALLATION

- A. Install pumps according to manufacturer's written instructions.
- B. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
- C. Support pumps and piping separately so piping is not supported by pumps.
- D. Suspend in-line pumps using continuous-thread hanger rod and vibration-isolation hangers. Install seismic bracing as required in Division 23 Section "Vibration and Seismic Controls for Mechanical Piping and Equipment."
- E. Set base-mounted pumps on concrete foundation. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
  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 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.

### 3.3 ALIGNMENT

- 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. 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. 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 the same size as piping connected to pumps. Provide reducers where required to adapt to line sizes indicated.
- D. Install check valve and throttling valve on discharge side of in-line circulators.
- E. Install nonslam check valve and shut-off valve 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. Install at integral pressure-gage tapings where provided.
- I. Electrical power and control wiring and connections are specified in Division 26 Sections.

### 3.5 START-UP PROCEDURES

- A. Verify that pumps are installed and connected according to the Contract Documents.
- B. Verify that electrical wiring installation complies with manufacturer's written instructions and the Contract Documents.
- C. Perform the following preventive maintenance operations and checks before starting:
  1. Lubricate bearings.
  2. Remove grease-lubricated bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.

3. Disconnect coupling and check motor for proper rotation that matches direction marked on pump casing.
  4. Verify that pumps are free to rotate by hand and that pumps for handling hot liquids are free to rotate with pumps hot and cold. Do not operate pumps if they are bound or drag, until cause of trouble is determined and corrected.
  5. Check suction piping connections for tightness to avoid drawing air into pumps.
  6. Clean strainers.
  7. Verify that pump controls are correct for required application.
- D. Starting procedure for pumps with shutoff power not exceeding safe motor power is as follows:
1. Prime pumps by opening suction valves and closing drains, and prepare pumps for operation.
  2. Open cooling water-supply valves in cooling water supply to bearings, where applicable.
  3. Open circulating line valves if pumps should not be operated against dead shutoff.
  4. Start motors.
  5. Open discharge valves slowly.
  6. Check general mechanical operation of pumps and motors.
  7. Verify proper rotation of pump.
  8. Close circulating line valves once there is sufficient flow through pumps to prevent overheating.
- E. When pumps are to be started against closed check valves with discharge shutoff valves open, steps are the same, except open discharge valves before starting motors.
- F. Refer to Division 23 Section "Testing, Adjusting, and Balancing for Mechanical" for detailed requirements for testing, adjusting, and balancing hydronic systems.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps as specified below:
1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
  2. Review data in maintenance manuals. Refer to Division 01 Section "Closeout Procedures."
  3. Review data in maintenance manuals. Refer to Division 01 Section "Operation and Maintenance Data."
  4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION**