



DIVISION 23 – Heating, Ventilating, and Air-Conditioning (HVAC)  
23 21 00 – Hydronic Piping and Pumps  
23 21 23 – Hydronic Pumps

**PART 1 – GENERAL**

1.01 DESCRIPTION OF WORK

A. Provide pumps and required system trim for heating, chilled water, and dual temperature water systems including all related appurtenances for a complete and operating systems.

1.02 SECTION INCLUDES

A. Close Coupled, Inline Pump

1.03 RELATED SECTIONS

A. Drawings and general provisions of the contract, including general and supplementary Conditions and Division 1 Specification Sections, apply to these Sections.

- Section \*\*\* - Alignment of Rotating Equipment
- Section \*\*\* - Cast-in-Place Concrete
- Section \*\*\* - Mechanical General Requirements
- Section \*\*\* - Supports, Anchors, and Sleeves
- Section \*\*\* - Motors and Starters
- Section \*\*\* - Drives
- Section \*\*\* - Mechanical Identification
- Section \*\*\* - Vibration Isolation
- Section \*\*\* - Piping Insulation
- Section \*\*\* - Equipment Installation
- Section \*\*\* - Hydronic Piping and Specialties
- Section \*\*\* - Testing, Adjusting, and Balancing
- Section \*\*\* - Meters and Gauges
- Section \*\*\* - Electrical

1.04 REFERENCES

- A. HI - Hydraulic Institute.
- B. ANSI - American National Standards Institute.
- C. OSHA - Occupational Safety & Health Administration.
- D. ASHRAE – American Society of Heating, Refrigeration and Air-Conditioning Engineers.
- E. NEMA - National Electrical Manufacturers Association.
- F. UL - Underwriters Laboratories.
- G. ETL - Electrical Testing Laboratories.
- H. CSA - Canadian Standards Association.
- I. NEC - National Electric Codes.
- J. ISO - International Standards Organization.
- K. IEC - International Electrotechnical Commission.
- L. ASME – American Society of Mechanical Engineers.

1.05 SUBMITTAL

- A. Submit each item in this article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Submit manufacturer's installation instructions under provisions of General Conditions and Division 1.
  - Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts lists.

- Under provisions of commissioning documentation, testing of pumps, as well as training of owner's operation and maintenance personnel may be required in cooperation with the commissioning consultant.
- C. Product Data including certified performance curves and rated capacities of selected model, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate pump's operating point on curves.
- D. Complete Package information Product Data including:
  - System summary sheet (where applicable)
  - Sequence of Operation
  - Shop drawing indicating dimensions, required clearances and location and size of each field connection
  - Power and control wiring diagram
  - System profile analysis including pump curves, system curve, and variable speed pump curves (where applicable)
  - Pump data sheets - Rated capacities of selected models and indication of pump's operating point on curves.
  - Submittals on furnished specialties and accessories
  - Submittals must be specific to this project. Generic submittals will not be accepted
- E. Hanging and support requirements should follow the recommendations in the manufacturer's installation instructions.

#### 1.06 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.
- B. Ensure pump operation, at specified system fluid temperatures without vapor binding and cavitation, is non-overloading in parallel or individual operation, and operates to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.
- C. Ensure pump pressure ratings are at least equal to system's maximum operating pressure at point where installed but not less than specified.
- D. Equipment manufacturer shall be a company specializing in manufacture, assembly, and field performance of provided equipment with a minimum of 20 years experience.
- E. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump's balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the contractor and to the engineer.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs if required for handling. Materials damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- B. Store materials in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- C. Use all means necessary to protect equipment before, during, and after installation.
- D. All scratched, dented, and otherwise damaged units shall be repaired or replaced as directed by the Architect Engineer.

#### 1.08 WARRANTY:

- A. Provide a minimum One (1) year warranty on materials and installation under provision of Section 01 78 36

## **PART 2 – PRODUCTS**

### 2.01 MANUFACTURERS

- A. The specifying engineer reserves the right to specify a primary supplier / lead spec manufacturer on all supplied schedule and specification documents. These primary suppliers have led their respective industry in research and development and their products have had proven track records in the field. These primary suppliers, in the opinion of this engineering firm, produce a superior product to the alternately listed manufacturers. The contractor may choose to supply equivalent equipment as manufactured by the alternately specified manufacturer. This alternately specified equipment shall be supplied on a deduct alternate basis and based on the approval of the supplied alternate manufacturer's submittals. The use of a primary supplier and deduct alternates protects the specifying engineer's design concept, but allows for a check-and-balance system to protect the post-commissioning owner.
- B. Contractor shall furnish and install new close-coupled inline pump for chilled water and hot water heating systems as indicated on the drawings. Pumps shall be Series e-90 as manufactured by **Bell & Gossett** under base bid. Equivalent units as manufactured by other manufacturers may be submitted as deduct alternates. Pumps shall meet types, sizes, capacities, and characteristics as scheduled on the Equipment Schedule drawings. Pump substitutions shall be provided with connection sizes equal to those scheduled. Pump connections shall not be downsized. Pump substitutions shall not be provided at efficiencies less than those scheduled.

## 2.02 COMPONENTS

- A. The pumps shall be close-coupled, inline for vertical or horizontal installation, in cast iron bronze fitted (or all bronze) construction specifically designed for quiet operation. Suitable standard operations at 250°F and 175 PSIG working pressure. The pump internals shall be capable of being serviced without disturbing piping connections.
- B. As an option, an EPR/Graphite loaded Silicon-Carbide/Graphite loaded Silicon-Carbide or FKM/Carbon/Silicon-Carbide seal (225°F maximum operating temperature) should be used in lieu of the standard EPR/Carbon/Silicon-Carbide seal (250°F maximum operating temperature).
- C. The pumps shall have a solid stainless steel shaft that is integral to the motor.
- D. The motor bearings shall support the shaft via heavy-duty permanently lubricated ball bearings.
- E. Pump shall be equipped with an internally-flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall be the unitized type with stainless steel drive tabs, EPR bellows and seat gasket, stainless steel spring, and be of a carbon silicon-carbide design with the carbon face rotating against a stationary silicon-carbide face.
- F. Pump shaft shall connect to a brass impeller. Impeller shall be hydraulically and dynamically balanced, threaded onto the motor shaft.
- G. Pump should be designed to allow for true back pull-out access to the pump's working components for ease of maintenance.
- H. Pump volute shall be of a cast iron design for heating systems or cast brass for domestic water systems. The connection style on the cast iron and bronze pumps shall be flanged. Volute shall include gauge ports at nozzles.
- I. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have permanently lubricated ball bearings sized to offset the additional bearing loads associated with the closed-coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.
- J. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.
- K. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.
- L. Pump manufacturer shall be ISO-9001 certified.
- M. Each pump shall be factory tested and name-plated before shipment.

## 2.03 ACCESSORIES

- A. Where noted on the schedule provide one spare mechanical seal for each model type for primary pump.
- B. Where noted on schedule an EPR/Graphite loaded Silicon-Carbide/Graphite loaded Silicon-Carbide or FKM/Carbon/Silicon-Carbide seal (225°F maximum operating temperature) should be used in lieu of the standard EPR/Carbon/Silicon-Carbide seal (250°F maximum operating temperature).
- C. Where noted on schedule pumping equipment may require one of all of the following tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or Witnessed Tests.
- D. Where noted on the schedule provide an external mechanical seal flush line (-F).

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow.
- C. Furnish and install triple duty valves on the discharge side of all pumps and furnish and install a line size shut-off valve on the suction side of all pumps.
- D. Provide temperature and pressure gauges where and as detailed or directed.
- E. Provide an adequate number of isolation valves for service and maintenance of the system and its components.
- F. Circulating pump shall have sufficient capacity to circulate the scheduled GPM against the scheduled external head (feet) with the horsepower and speed as scheduled and/or as denoted on the drawings. Motors shall be of electrical characteristics as scheduled, denoted and/or as indicated on the electrical plans and specifications. Pump characteristics shall be such that the head of the pump under varying conditions shall not exceed the rated horsepower of the drive motor.
- G. On systems where the final balancing procedure requires the triple duty valve to be throttled more than 25% to attain design flow (on a constant speed pumping system) and no future capacity has been built in to the pump, the pump impeller must be trimmed to represent actual system head resistance. The pump provider and engineer of record, based on the balancing contractor's reports, shall determine the final impeller trim diameter.
- H. All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any loads or stresses being applied to the connections or piping. All piping shall be fitted to the pumps even though piping adjustments may be required after the pipe is installed.
- I. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturer's instruction and applicable state, federal, and local codes.
- J. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the control's contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal, and local codes.

END OF SECTION