

## **SECTION 23 21 23 HYDRONIC PUMPS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. Hydronic pumps for Heating, Ventilating and Air Conditioning.
- B. Definitions:
  - 1. Capacity: Liters per second (L/s) (Gallons per minute (GPM)) of the fluid pumped.
  - 2. Head: Total dynamic head in kPa (feet) of the fluid pumped.
  - 3. Flat head-capacity curve: Where the shutoff head is less than 1.16 times the head at the best efficiency point.

#### **1.2 RELATED WORK**

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- E. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- F. Section 23 21 13, HYDRONIC PIPING.
- G. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT.
- H. Section 26 29 23, VARIABLE FREQUENCY MOTOR CONTROLLERS.

#### **1.3 QUALITY ASSURANCE**

- A. Refer to Paragraph, QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- B. Design Criteria:
  - 1. Pumps design and manufacturer shall conform to Hydraulic Institute Standards.
  - 2. Pump sizes, capacities, pressures, operating characteristics and efficiency shall be as scheduled.

3. Head-capacity curves shall slope up to maximum head at shut-off. Curves shall be relatively flat for closed systems. Select pumps near the midrange of the curve, so the design capacity falls to the left of the best efficiency point, to allow a cushion for the usual drift to the right in operation, without approaching the pump curve end point and possible cavitation and unstable operation. Select pumps for open systems so that required net positive suction head (NPSHR) does not exceed the net positive head available (NPSHA).
  4. The head for pumps submitted for pumping through condensers and through chilled water coils and evaporators shall be increased, if necessary, to match the equipment approved for the project.
  5. Pump Driver: Furnish with pump. Size shall be non-overloading at any point on the head-capacity curve including one pump operation in a parallel or series pumping installation.
  6. Provide all pumps with motors, impellers, drive assemblies, bearings, coupling guard and other accessories specified. Statically and dynamically balance all rotating parts.
  7. Furnish each pump and motor with a nameplate giving the manufacturers name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current and motor efficiency.
  8. Test all pumps before shipment. The manufacturer shall certify all pump ratings.
  9. After completion of balancing, provide replacement of impellers or trim impellers to provide specified flow at actual pumping head, as installed.
  10. Furnish one spare seal and casing gasket for each pump to the COTR.
- C. Allowable Vibration Tolerance for Pump Units: Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.

#### 1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  1. Pumps and accessories.
  2. Motors and drives.
  3. Variable speed motor controllers.
- C. Manufacturer's installation, maintenance and operating instructions, in accordance with Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- D. Characteristic Curves: Head-capacity, efficiency-capacity, brake horsepower-capacity, and NPSHR-capacity for each pump and for combined pumps in parallel or series service. Identify pump and show fluid pumped, specific gravity, pump speed and curves plotted from zero flow to maximum for the impeller being furnished and at least the

maximum diameter impeller that can be used with the casing.

## **1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only:
- B. American Iron and Steel Institute (AISI):
  - AISI 1045..... Cold Drawn Carbon Steel Bar, Type 1045
  - AISI 416..... Type 416 Stainless Steel
- C. American National Standards Institute (ANSI):
  - ANSI B15.1-00..... Safety Standard for Mechanical Power Transmission Apparatus
  - ANSI B16.1-00 ..... Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800
- D. American Society for Testing and Materials (ASTM):
  - A48-98..... Gray Iron Castings
  - B62-02..... Composition Bronze or Ounce Metal Castings
- E. Maintenance and Operating Manuals in accordance with Section 01 00 00, General Requirements.

## **PART 2 - PRODUCTS**

### **2.1 CENTRIFUGAL PUMPS, BRONZE FITTED**

In-Line Type, Base Mounted End Suction or Double Suction Type:

- A. Casing and Bearing Housing: Close-grained cast iron, ASTM A48.
- B. Casing Wear Rings: Bronze.
- C. Suction or Discharge 65 mm (2-1/2 inches) and Larger: Plain face flange, 850 kPa (125 psig), ANSI B16.1.
- D. Casing Vent: Manual brass cock at high point.
- E. Casing Drain and Gage Taps: 15 mm (1/2-inch) plugged connections minimum size.
- F. Bearings: Regreaseable ball or roller type. Provide lip seal and slinger outboard of each bearing.
- G. Impeller: Bronze, ASTM B62, enclosed type, keyed to shaft.
- H. Shaft: Steel, AISI Type 1045 or stainless steel.
- I. Shaft Seal: Manufacturer's standard mechanical type to suit pressure and temperature and fluid pumped.

- J. Shaft Sleeve: Bronze or stainless steel.
- K. Motor: Furnish with pump. Refer to Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT.
- L. Base Mounted Pumps:
  - 1. Designed for disassembling for service or repair without disturbing the piping or removing the motor.
  - 2. Impeller Wear Rings: Bronze.
  - 3. Shaft Coupling: Non-lubricated steel flexible type or spacer type with coupling guard, ANSI B15.1, bolted to the baseplate.
  - 4. Base: Cast iron or fabricated steel for common mounting to a concrete base.
  - 5. Suction Diffuser:
    - a. Body: Cast iron with steel inlet vanes and combination diffuser-strainer-orifice cylinder with 5 mm (3/16-inch) diameter openings for pump protection. Provide taps for strainer blowdown and gage connections.
    - b. Provide adjustable foot support for suction piping.
    - c. Strainer free area: Not less than five times the suction piping.
    - d. Provide disposable start-up strainer.
  - 6. Suction Strainer, "Y" Type: Section 23 21 13, HYDRONIC PIPING.
    - a. May be furnished in lieu of a suction diffuser at the Contractor's option. Provide equivalent support of pump suction piping.
- M. Variable Speed Pumps:
  - 1. The pumps shall be the type shown on the drawings and specified herein flex coupled to an open drip-proof motor. Provide motors 30 kW (40 horsepower) and larger with thermal overload switches.
  - 2. Variable Speed Motor Controllers: Refer to Section 26 29 23, VARIABLE FREQUENCY MOTOR CONTROLLERS and to Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION paragraph, Variable Speed Motor Controllers. Furnish controllers with pumps and motors.
  - 3. Pump operation and speed control shall be as shown on the drawings.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Follow manufacturer's written instructions for pump mounting and start-up. Access/Service space around pumps shall not be less than minimum space recommended by pumps manufacturer.

- B. Support piping adjacent to pump such that no weight is carried on pump casing. First 3 hangers for each pipe shall be spring and neoprene type.
- C. Permanently support in-line pumps by the connecting piping only, not from the casing or the motor eye bolt.
- D. Sequence of installation for base-mounted pumps:
  - 1. Level and shim the unit base and grout to the concrete pad.
  - 2. Shim the driver and realign the pump and driver. Correct axial, angular or parallel misalignment of the shafts.
  - 3. Connect properly aligned and independently supported piping.
  - 4. Recheck alignment.
- E. Provide drains for bases and seals for base mounted pumps, piped to and discharging into floor drains.
- F. Coordinate location of thermometer and pressure gauges as per Section 23 21 13, HYDRONIC PIPING.

### **3.2 START-UP**

- A. Verify that the piping system has been flushed, cleaned and filled.
- B. Lubricate pumps before start-up.
- C. Prime the pump, vent all air from the casing and verify that the rotation is correct. To avoid damage to mechanical seals, never start or run the pump in dry condition.
- D. Verify that correct size heaters-motor over-load devices are installed for each pump controller unit.
- E. Perform field mechanical balancing if necessary to meet specified vibration tolerance.
- F. Ensure the disposable strainer is free of debris prior to testing and balancing of the hydronic system.
- G. After several days of operation, replace the disposable start-up strainer with a regular strainer in the suction diffuser.

END OF SECTION 232123