

**RORSECTION 23 21 23  
HYDRONIC PUMPS**

SPEC WRITER NOTES:

1. Delete between // ---- // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraph.

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Hydronic pumps for Heating, Ventilating and Air Conditioning.

**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 11, LOW-VOLTAGE MOTOR STARTERS.

**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. Pump Driver: Furnish with pump. Size shall be non-overloading at any point on the head-capacity curve, including in a parallel or series pumping installation with one pump in operation.

5. Provide all pumps with motors, impellers, drive assemblies, bearings, coupling guard and other accessories specified. Statically and dynamically balance all rotating parts.
  6. 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.
  7. Test all pumps before shipment. The manufacturer shall certify all pump ratings.
  8. After completion of balancing, provide replacement of impellers or trim impellers to provide specified flow at actual pumping head, as installed.
- 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(R2008)..... Safety Standard for Mechanical Power Transmission Apparatus

ANSI B16.1-05 ..... Cast Iron Pipe Flanges and Flanged Fittings,  
Class 25, 125, 250 and 800

D. American Society for Testing and Materials (ASTM):

A48-03 (2008) ..... Standard Specification for Gray Iron Castings

B62-2009 ..... Standard Specification for Composition Bronze or  
Ounce Metal Castings

E. Maintenance and Operating Manuals in accordance with Section 01 00 00,  
General Requirements.

**1.6 DEFINITIONS**

A. Capacity: Liters per second (L/s) (Gallons per minute (GPM) of the fluid  
pumped.

B. Head: Total dynamic head in kPa (feet) of the fluid pumped.

C. Flat head-capacity curve: Where the shutoff head is less than 1.16 times  
the head at the best efficiency point.

**1.7 SPARE MATERIALS**

A. Furnish one spare seal and casing gasket for each pump to the// Resident  
Engineer//Project Manager//.

**PART 2 - PRODUCTS**

**2.1 CENTRIFUGAL PUMPS, BRONZE FITTED**

A. General:

1. Provide pumps that will operate continuously without overheating  
bearings or motors at every condition of operation on the pump curve,  
or produce noise audible outside the room or space in which  
installed.

2. Provide pumps of size, type and capacity as indicated, complete with  
electric motor and drive assembly, unless otherwise indicated.  
Design pump casings for the indicated working pressure and factory  
test at 1½ times the designed pressure.

3. Provide pumps of the same type, the product of a single manufacturer,  
with pump parts of the same size and type interchangeable.

4. General Construction Requirements

a. Balance: Rotating parts, statically and dynamically.

b. Construction: To permit servicing without breaking piping or  
motor connections.

c. Pump Motors: Provide high efficiency motors, inverter duty for  
variable speed service. Refer to Section 23 05 12, GENERAL MOTOR  
REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT. Motors shall  
be Open Drip Proof and operate at 1750 rpm unless noted otherwise.

d. Heating pumps shall be suitable for handling water to 225°F.

- e. Provide coupling guards that meet ANSI B15.1, Section 8 and OSHA requirements.
  - f. Pump Connections: Flanged.
  - g. Pump shall be factory tested.
  - h. Performance: As scheduled on the Contract Drawings.
5. Variable Speed Pumps:
- a. The pumps shall be the type shown on the drawings and specified herein flex coupled to an open drip-proof motor.
  - b. Variable Speed Motor Controllers: Refer to Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS 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.
  - c. Pump operation and speed control shall be as shown on the drawings.
- B. In-Line Type, Base Mounted End Suction or Double Suction Type:
- 1. Casing and Bearing Housing: Close-grained cast iron, ASTM A48.
  - 2. Casing Wear Rings: Bronze.
  - 3. Suction and Discharge: Plain face flange, 850 kPa (125 psig), ANSI B16.1.
  - 4. Casing Vent: Manual brass cock at high point.
  - 5. Casing Drain and Gage Taps: 15 mm (1/2-inch) plugged connections minimum size.
  - 6. Impeller: Bronze, ASTM B62, enclosed type, keyed to shaft.
  - 7. Shaft: Steel, AISI Type 1045 or stainless steel.
  - 8. Shaft Seal: Manufacturer's standard mechanical type to suit pressure and temperature and fluid pumped.
  - 9. Shaft Sleeve: Bronze or stainless steel.
  - 10. Motor: Furnish with pump. Refer to Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT.
  - 11. Base Mounted Pumps:
    - a. Designed for disassembling for service or repair without disturbing the piping or removing the motor.
    - b. Impeller Wear Rings: Bronze.
    - c. Shaft Coupling: Non-lubricated steel flexible type or spacer type with coupling guard, ANSI B15.1, bolted to the baseplate.
    - d. Bearings (Double-Suction pumps): Regreaseable ball or roller type. Provide lip seal and slinger outboard of each bearing.
    - e. Base: Cast iron or fabricated steel for common mounting to a concrete base.
  - 12. Provide line sized shut-off valve and suction strainer, maintain manufacturer recommended straight pipe length on pump suction (with

blow down valve). Contractor option: Provide suction diffuser as follows:

- 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.

SPEC WRITER NOTE: Vertical turbine pumps shall be used for condenser water systems where the centrifugal pumps or the piping layouts are such that the required net positive suction head is in excess of what the conventional centrifugal pump can produce.

## 2.2 VERTICAL TURBINE PUMP

- A. Pump Bowls: Close-grained cast iron, flanged and bolted type, reinforced with four ribs (minimum), which are at least one-half the flange metal thickness.
- B. Impellers: Bronze, enclosed type, secured to the shaft with steel tempered keys.
- C. Replaceable Wear Rings: Bronze.
- D. Pump Shaft: AISI Type 416, stainless steel.
- E. Suction Bell: Cast iron, belled to reduce entrance losses.
- F. Suction Strainer: Bronze, basket type, with net open area at least twice the calculated area at the suction bell lip.
- G. Sleeve Bearings: Bronze provided in each bowl and in the suction bell, to be lubricated by the pumped fluid. Suction bell bearing shall be packed permanently with non-soluble grease and fitted with a bronze sand collar.
- H. Discharge Column Pipe: Steel with threaded or flanged connections.
- I. Lineshaft: AISI Type 1045, steel connected through steel threaded couplings. Shaft (and column) sections shall not exceed 3 m (ten feet) in length.
- J. Replaceable Shaft Sleeves: Stainless steel "shrunkfit" on the line-shaft at each bearing location.
- K. Column Connection Bearings: Fluted rubber supported by non-threaded "spider" type retainers butted between the machined faces of the discharge column. "Spider" shall be made of nickel-iron with a minimum brinell of 170.

- L. Surface Discharge Head Assembly: Close-grained cast iron with integral 850 kPa (125 psig) flat face flange, ANSI B16.1. Provide two lifting lugs with capacity to support the weight of the entire pump. Provide steel base plate and hardware for securing the discharge head to the base plate.
- M. Stuffing Box: Manufacturer's standard, two Teflon sealcages, and split type packing gland.
- N. Stuffing Box Bearing Housing: Cast iron, one piece, with bronze sleeve bearings.
- O. Motor: Vertical, hollow shaft type, direct connected.

### **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. Provide drains for bases and seals for base mounted pumps, piped to and discharging into floor drains.
- C. 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. Field modifications to the bearings and or impeller (including trimming) are not permitted. If the pump does not meet the specified vibration tolerance send the pump back to the manufacturer for a replacement pump. All modifications to the pump shall be performed at the factory.
- 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.

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