

**SECTION 23 22 23**  
**STEAM CONDENSATE PUMPS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Steam condensate 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 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- D. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- E. Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING.
- F. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT.
- G. 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. 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 Resident Engineer and Project Manager.
- 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 CONDENSATE PUMP, PAD-MOUNTED

- A. General: Factory assembled unit consisting of vented receiver tank, motor-driven pumps, interconnecting piping and wiring, motor controls (including starters, if necessary) and accessories, designed to receive, store, and pump steam condensate.
- B. Receiver Tank: Cast iron or galvanized steel, with threaded openings for connection of piping and accessories and facilities for mounting float switches. Receivers for simplex pumps shall include all facilities for future mounting of additional pump and controls.
- C. Furnish seals for condensate pump with a minimum temperature rating of 392 degrees C (250 degrees F).
- D. Centrifugal Pumps: Bronze fitted with mechanical shaft seals.
  - 1. Designed to allow removal of rotating elements without disturbing connecting piping or pump casing mounting.
  - 2. Shafts: Stainless steel, AISI Type 416 or alloy steel with bronze shaft sleeves.
  - 3. Bearings: Regreaseable ball or roller type.
  - 4. Casing wearing rings: Bronze.
- F. Motors: Refer to Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT.

G. Pump Operation:

1. Float Switches: NEMA 1, mounted on receiver tank, to start and stop pumps in response to changes in the water level in the receiver and adjustable to permit the controlled water levels to be changed. Floats and connecting rods shall be copper, bronze or stainless steel.
2. Alternator: Provide for duplex units to automatically start the second pump when the first pump fails in keeping the receiver water level from rising and to alternate the order of starting the pumps. For units 0.25 kW (1/3 horsepower) and smaller, the alternator may be the mechanical type for use in lieu of float switches.

H. Control Cabinet for 3 Phase (0.37 kW (1/2 hp) and larger) Units: NEMA 1, UL approved, factory wired, enclosing all controls, with indicating lights, manual switches and resets mounted on the outside of the panel. Attach cabinet to the pump set with rigid steel framework, unless remote mounting is noted on the pump schedule.

1. Motor starters: Magnetic contact types with circuit breakers or combination fusible disconnect switches. Provide low voltage control circuits (120 volt maximum) and "hand-off-automatic" (H-O-A) switches for each pump.
2. Indicating lights for each pump: Green to show that power is on, red to show that the pump is running.

I. Electric Wiring: Suitable for 93 degrees C (200 degrees F) service; enclosed in liquid-tight flexible metal conduit where located outside of control cabinet.

J. Receiver Accessories:

1. Thermometer: 34-216 degrees C (100 - 420 degrees F), mounted below minimum water level.
2. Water level gage glass: Brass with gage cocks which automatically stop the flow of water when the glass is broken. Provide drain on the lower gage cock and protection rods for the glass.

### **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. Pad-mounted Condensate Pump: Level, shim, bolt, and grout the unit base onto the concrete pad.
- F. Sump Type Condensate Pump: Apply two coats of asphalt or bituminous compound on the exterior of the receiver tank, and mount level and flush in the floor with waterproofing gaskets and grouting to prevent ground water from entering the building from around the receiver.
- G. Provide drains for bases and seals for base mounted pumps, piped to and discharging into floor drains.
- H. Coordinate location of thermometer and pressure gauges as per Section 23 22 13, STEAM AND CONDENSATE HEATING 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.

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