

SECTION 23 22 23
STEAM CONDENSATE PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Steam condensate 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 23 05 11, COMMON WORK RESULTS FOR BOILER PLANT and STEAM GENERATION.
D. Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING.
E. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALITY ASSURANCE in Section 23 05 10, COMMON WORK RESULTS FOR BOILER PLANT 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. Select pumps 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 one pump operation in a parallel or series pumping installation.
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.
9. Furnish one spare seal and casing gasket for each pump to the Resident Engineer.

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.
- C. Manufacturer's installation, maintenance and operating instructions, in accordance with Section 23 05 10, COMMON WORK RESULTS FOR BOILER PLANT and STEAM GENERATION.
- D. Characteristic Curves: Head-capacity, efficiency-capacity, brake horsepower-capacity, and NPSHR-capacity for each pump.

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
B62-09.....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.

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 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 121 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.
- E. Motors: Refer to Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.
- F. 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.
- G. 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.
- H. Electric Wiring: Suitable for 93 degrees C (200 degrees F) service; enclosed in liquid-tight flexible metal conduit where located outside of control cabinet.
- I. 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.

2.2 CONDENSATE PUMP, SUMP TYPE

- A. General: Factory assembled unit consisting of motor-driven pump(s) mounted on a horizontal cover plate bolted to a vented sump-type receiver, interconnecting wiring and piping, motor controls and accessories, designed to receive, store, and pump steam condensate.
- B. Receiver Tank: Vertical, cylindrical, cast iron sides and bottom, designed for service underground or below the floor. Inlet connection shall be located nine inches below the cover plate. Provide floor mounting gasket.
- C. Receiver Cover Plate: Heavy gage steel designed to support weight of pumps, motors, and accessories and support foot traffic with no deflection. Provide for mounting of pumps, motor and accessories by bolting to the cover. Provide threaded openings for piping connections and a bolted inspection plate for viewing interior of receiver. All bolted connections to cover plate, and between cover plate and receiver, shall be gasketed so that no vapor will escape into the room.
- D. Furnish seals for condensate pump with a minimum temperature rating of 121 degrees C (250 degrees F).
- E. Pumps: Centrifugal type, vertical extended shaft, bronze fitted, flexible-coupled, designed for submerged operation.

1. Shaft: Stainless steel, AISI Type 416.
2. Shaft bearings: Bronze, water lubricated.
3. Shaft seal at cover plate: Packed type with bronze packing gland.
4. Thrust bearings: Regreaseable ball type located above the cover plate.
5. Discharge pipes: Terminate above the cover plate.
6. Pump-motor mounting: Bolted to brackets bolted to the cover plate.

Removal of one pump shall not affect operation of the second pump.

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

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. Permanently support in-line pumps by the connecting piping only, not from the casing or the motor eye bolt.
- C. 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.

- D. Pad-mounted Condensate Pump: Level, shim, bolt, and grout the unit base onto the concrete pad.
- E. 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.
- F. 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. 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.

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