



DESIGN REQUIREMENTS

HYDRONIC PUMPS

GENERAL INFORMATION

- 1.1 This section applies to hydronic pumps for HVAC and Plumbing Systems.

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- 2.1 Submit friction head calculations and pump curves for all water systems.
- 2.2 In order to insure stable operation and prevent any possibility of hunting, the pump curve shall be continuously rising from maximum capacity up to the shut-off head. Shut-off head minimum shall be 10 percent greater than the design head. Except for double suction pumps, shut-off head shall be 20 percent greater than design head.
- 2.3 All pump casings shall be hydrostatically tested at $1\frac{1}{2}$ times design working pressure. The design working pressure is sum of total dynamic head (TDH) plus total system static water head.
- 2.4 Pumps shall be selected to operate at or near their point of peak efficiency, thus allowing for operation at capacities of approximately 25% beyond design capacity. In addition, the design impeller diameter shall be selected so that the design capacity of each pump (GPM and TDH) shall not exceed 90% of the capacity obtainable with maximum impeller diameter at the design speed for that model.
- 2.5 The pump motor shall be selected as non-overloading over the entire pump curve shown by the manufacturer. Pump performance and motor characteristics shall be such that motor will not be loaded beyond its service factor.
- 2.6 Mechanical seals shall be used on all pumps except fire pumps, where stuffing boxes shall be used and open condenser water pumps that shall have packing seals.
- 2.7 $(N + 1)$ pumps shall be provided on building hydronic systems for redundancy.
- 2.8 Condensate drainage shall run by gravity and not be pumped.
- 2.9 Single-Source Responsibility: Obtain each category of pumps from a single-source and by a single manufacturer

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- 2.10 Install pumps and associated appurtenances in strict accordance with the manufacturer's requirements for maintaining satisfactory hydraulic performance.
- 2.11 Equipment Requirements
- a. Inline Circulators
 - 1. Circulators shall be horizontal inline, centrifugal, separately-coupled, single-stage, bronze-fitted, radially split case design, with mechanical seals, and rated for 125 psig working pressure and 225°F. continuous water temperature.
 - b. Vertical Inline Pumps
 - 1. Pumps shall be centrifugal, close-coupled, single-stage, bronze-fitted, radially split case design, with mechanical seals, and rated for 175 psig working pressure and 225°F, integral thrust bearings with 50,000 hour life, rated L10 and dust-sealed.
 - c. Base-Mounted, Separately-Coupled, End-Suction Pumps
 - 1. Pumps shall be base-mounted, centrifugal, separately-coupled, end-suction, single-stage, bronze-fitted, radially split case design, and rated for 175 psig working pressure and 225°F. continuous water temperature. Pumps fabrication shall conform with the Hydraulics Institute (HI) Standards. Pump bearing housing assembly shall have oil lubricated bearings with 50,000 hour life, rated L10 and dust-sealed, replaceable without disturbing piping connections.
 - d. Base-Mounted, Horizontal Split Case Pumps
 - 1. Pumps shall be base-mounted, centrifugal, separately-coupled, side-suction and discharge, single-stage, bronze-fitted, and rated for 175 psig working pressure and 225°F. continuous water temperature. Pumps fabrication shall conform to the Hydraulics Institute (HI) Standards. Pump bearing housing assembly shall have oil lubricated bearings with 50,000 hour life, rated L10 and dust-sealed, replaceable without disturbing piping connections.
 - e. Condensate Collecting and Pumping
 - 1. Condensate pumping units shall consist of two pumps, each directly connected to an electric motor, and one receiver made of heavy galvanized steel and two float switches. Where cavitation is anticipated from fluid flash, the receiver shall be mounted above the pump on a structural steel support, so that return flows by gravity to pump suction. Receiver shall be provided with an air vent relief line up to the ceiling, through a return bend fitting, and piped down to within 6" of floor. The unit shall have two (2) float switches. Each float switch shall start its respective pump at a

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predetermined high water level, stopping it when the water has been discharged. The float switches shall be wired so that the second pump starts in the event that the first pump fails to operate. Under a peak load condition, such as warm-up, both units shall be capable of operating simultaneously. The discharge connection of each pump shall have a check valve and gate valve. Provide individual feeder to each pump from separate power sources.

f. Condensate Pump Set

1. Pumps shall be mounted on the receiver where cavitation is not anticipated from fluid flash and be electric, centrifugal, close-coupled, vertical design, permanently aligned, bronze-fitted, with enclosed bronze case ring and mechanical seal. Factory wiring shall be provided between pump and float switch for single external electrical connection.

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- 3.1 All pumps shall be installed with line size isolation valves on both sides.
- 3.2 The pump and motor shall be installed on a common steel or cast iron base, isolated from the building structure so that the unit will not transmit vibration to the building. The pump coupling to the motor shall be flexible and shall be equipped with a guard.
- 3.3 Valved gauges shall be provided at the pump suction and discharge.
- 3.4 Piping connections to pumps shall not be supported by the pump, but shall be provided with floor flanged base elbows which shall rest on the concrete pump foundation.
- 3.5 Suction inlet pipe for all pumps shall be a straight section of pipe of not less than 10 pipe diameters in direction of flow. Where space conditions will not permit suction inlet pipe of required length, provide a suction diffuser.
- 3.6 Support pumps and piping separately so that piping is not supported by pumps.
- 3.7 Suspend in-line pumps using continuous-thread hanger rod and vibration-isolation hangers of sufficient size to support weight of pump independent of piping system.
- 3.8 Set base-mounted pumps on concrete foundation. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
- 3.9 Provide vibration isolation as necessary to prevent excessive noise and vibration. In general, install large pumps located above grade on concrete inertia base with spring vibration isolators. Where an inertia base is used, support piping near pumps with spring hangers.

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- 3.10 Install suction diffusers on pump inlets with ample space for basket removal. Where pumps are mounted on inertia pads, suction diffuser will be supported with steel pipe section on inertia pad. All other installations, the suction diffuser will be supported by steel pipe section and a neoprene pad 1" thick. Remove start-up strainer after start-up and pipe cleaning.
- 3.11 Pump flanges shall be of the same class as the connecting flanges on piping systems.
- 3.12 Align pump and motor shafts and piping connections after setting them on foundations, after grout has been set and foundation bolts have been tightened, and after piping connections have been made. Alignment shall be made with dial indicator to a tolerance of $\pm.002"$.
- 3.13 Adjust alignment of pump and motor shafts for angular and parallel alignment prior to operation per manufacturers' written instructions.
- 3.14 Triple duty valves are not allowed.

REFERENCE

- 4.1 The applicable CSI Specification Section is 23 21 23.