Basis of Design

This section applies to the selection and installation of pumps for hot and chilled water circulation, sump and steam condensate return systems. Not included are vacuum pumps, sewage lift stations, ejectors, air pumps, or piston pumps.

Design Criteria

- Locate pumps where they provide easy service accessibility and isolate them to prevent pumping or vibration source noise from disturbing the surrounding occupied areas. Locate pumps in mechanical rooms wherever possible.
- Provide pumps based on the highest efficiency, nonproprietary products available.
- Provide pumps that allow installation of a larger impeller to meet future requirements whenever possible.
- Provide stand-by pumps when shutdowns cannot be tolerated for repairs and maintenance. For example, condensate pump stations, sewer lift stations, and primary pumping loops.
- Provide pumps that operate at 1800 rpm.
- Provide centrifugal-type pumps where the shutoff head is not more than 25% greater than the operating head.
- Provide motors that are not overloaded at any point on the pump's operating curve.
- Refer to Motors and VFDs and Testing, Adjusting and Balancing sections for additional requirements on systems with variable frequency drives.
- Provide check valves in the pump discharge piping when pumps are operating in parallel, standby, or whenever a reverse flow may occur.
- Provide “lead-lag” start controls for sump and condensate pumps. Provide the ability to manually alternate the pumps on a “lead” start.
- Obtain discharge head information for condensate pumps from the UW Project Manager. There are locations on campus at an elevation lower than the Power Plant. Other locations are gravity return to the Power Plant hot well.
- Condensate pumps stations and sewer lift stations shall have dual pumps with standby power.

Design Evaluation

The following information is required to evaluate the design:

- Schematic Design Phase: Provide pump design criteria and location.
- Design Development Phase: Provide outline specifications, preliminary pump head calculations, and equipment layout plans.
- Construction Document Phase: Provide pump installation details and design calculations which shall include data showing pump impeller diameter and curve. For variable speed pumps include data of pumps at maximum and minimum rpm.

Construction Submittals

- Provide industry standard construction submittals, including pump curve(s) with design conditions plotted.
• Insure that a copy of each pump curve with design conditions plotted is included in the Operations and Maintenance manual.

**Products, Material and Equipment**

• Provide a pump that is a complete, integrated unit consisting of pump, motor, shaft, coupling, frame and base as manufactured at the factory.
• Pumps: Centrifugal, end suction or horizontal split case type.
• Provide close-coupled pumps up to 1 hp; otherwise provide a frame-mounted type.
• In-line circulators may be used when they can be adequately supported and are easily accessible.
• Provide frame-mounted, not close coupled, chilled water pumps, so that the entire casing and connections may be completely insulated.
• Provide mechanical seals on all pumps, suitable for the intended service.
• Provide certification from the pump manufacturer that the mechanical seals for pumps are suitable for the maximum expected temperature and chemical treatment used.
• Provide pressure gauges upstream and downstream of pump between pump and isolation valves.
• Provide an air vent in the casing of 1 HP and larger pumps.
• Provide vertical shaft-type sump pumps with the motor located above the sump. Do not use submersible pumps.
• Condensate pumps: Preferred is floor mounted, cast iron casing type. Select pump and pump seals for 210°F water without flashing for large condensate applications.
• Provide hot well type pumps with a cast iron or concrete sump.

**Installation, Fabrication and Construction**

• Specify each pump with separate balancing valves in the discharge piping so the design flow rate may be set.
• Provide each pump with check valves, isolating valves and unions or flanges for easy service removal.
• Provide all pumps with inlet strainers as part of the piping or pump inlet accessories.
• Grout pump base to the concrete equipment pad or inertia base for floor mounted pumps.
• For floor mounted condensate pumps, provide a sight glass and vent. The vent shall terminate outdoors. If an outdoor termination is not convenient, pipe the vent a minimum of 4 feet vertically and terminate at a drain.
• Provide isolation valves between condensate pumps and condensate receiver.
• Minimize pipe/pump flexible connections.
• Verify pump alignment and submit alignment data.

END OF DESIGN GUIDE SECTION