PUMPS

General

A/E shall schedule all pump data on the drawings (not within project specifications).

Select pumps and motors to be non-overloading (not into the service factor), at pump run-out (right end of published curve).

Pump efficiency at design conditions should be close to, or left of, peak pump efficiency.

Mechanical seals shall be used on all pumps except fire pumps, where stuffing boxes shall be used.

In general, specify pumps with 1800 rpm motors, unless design condition necessitates alternate motor speed.

Where remote start-stop, or status monitoring is required, use combination magnetic starter or variable speed drive (not manual starter).

Related Sections

Design Guideline Technical Sections:
15250 – Mechanical Insulation
15525 – Steam and Condensate Piping Systems and Specialties
15680 – Chilled Water Systems

U-M Master Specifications:
15060 – Basic Piping Materials and Methods
15100 – Valves
15160 – Pumps
15990 – Testing, Adjusting and Balancing

Equipment Requirements

Sump Pumps

In general, design sump pumps based on a submersible, duplex pumping system. Include slide rail on all sanitary pumps and on storm water pumps with motors larger than 5 HP, or sumps deeper than 4 feet. Include lifting lugs on pumps, automatic pump alternator and non-mercury float switches. Specify one-point common alarm (indicating high level, pump failure, or seal failure), and connect to Building Automation System.

Base Mounted End Suction Circulating Pumps

Base mounted end suction circulating pumps shall be of the centrifugal single stage type, with back pull-out design. Pump and motor shall be connected through a flexible drive coupling, with safety guard.

Pump and motor shall be properly mounted and aligned on a common, welded, rigid structural steel or cast iron base, with an enclosed perimeter with opening for grouting in place. Base shall be grouted in place, per U-M Master Specification Section 15160.

Base Mounted Double Suction Circulating Pumps

Base mounted double suction circulating pumps, shall be centrifugal, single-stage type with horizontal split case design for servicing the impeller without disruption of the piping. Vertical split case design is also acceptable, where floor space is at a premium.

Provide rigid steel grout base and grout as described for End Suction Pumps section above.

For pumps larger than 30HP, consider need for trimming impeller for improved energy efficiency, following initial testing and balancing. Consult U-M Project Coordinator.

In-Line Circulating Pumps

In-line circulating pumps shall be single stage; with cast iron body and bronze trim construction, unless special fluid handling dictates otherwise.

Vacuum Pump (Lab and Medical)

Vacuum pumps shall be bronze fitted, or all stainless steel, 1750 RPM and have mechanical seals. Vacuum pump package shall include tank with access hatch and all related controls and piping.

Coordinate equipment selection (rotary vane versus liquid ring) with U-M Project Coordinator.

System Application Requirements

Consider potential future expansion of pumped systems. Extent of expansion will be determined on a case-by-case basis. Consult with the University Project Coordinator for specific direction.

Domestic Water

Provide all bronze construction or stainless steel construction for all domestic water pump applications.

Storm and Sanitary

Use submersible sump pumps as described in Equipment Requirements above.

Hydronic Systems (Chilled Water, Condenser Water, Hot Water Heating)

Use end suction, double suction or in-line pumps as described in Equipment Requirements above. Typically, use base mounted pumps for all applications over 10HP.

Install fully redundant (N-1) stand-by pumps for heating systems.

For chiller and cooling tower installations, refer to Design Guideline Section 15680.

Steam Condensate Pumps

Typically, use electric condensate pumps for steam condensate. Consider use of air operated condensate pumps (only with U-M Project Coordinator approval) in steam tunnels, or other spaces with high ambient temperatures.

Design of condensate pumping system must consider receiver size, location, NPSH, flash area, and receiver and flash tank venting (properly sized, routed to outside). Refer to Design Guideline Technical Section 15525.

Installation Requirements

Install pumps and accessories in strict accordance with the manufacturer's requirements for maintaining satisfactory hydraulic performance.

Provide the following accessories for each pump (except sump pumps):

- Flexible connector, rated 2 times normal operating pressure, in suction and discharge lines. Refer to U-M Master Specification Section 15060. Flexible connectors are not typically required on in-line pumps (allowing pumps to be supported from adjacent piping).
- Isolation valving on both sides of the pumps. Not applicable for sump pumps. For condensate pumps, suction valve must comply with U-M Master Specification Section 15100.
- On pump discharge:
    - Triple duty valve and isolation valve, or
    - Non-slam check valve, throttling valve, approved (by U-M Project Coordinator) means of measuring flow, and isolation valve. Install flow measuring devices in strict accordance with manufacturer requirements to ensure proper performance. Throttling valve may be eliminated on variable flow (VSD) pumping applications.
- Pressure gauges on suction (prior to and after strainer) and discharge. For small, in-line pumps, pressure-temperature plugs may be used in lieu of gauges. Typically,

these three points should use manifolded ½" piping, with isolation ball valves and a single, common gauge.

Provide the following accessories for each sump pump:

- Flexible connectors are not typically required on sump pumps, except where vibration necessitates.
- Pressure gauge, check valve and isolation valve on pump discharge. Separate throttling valve is not typically required.

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. Support suction diffusers and piping directly in contact with pump from inertia base.

Suction inlet pipe for all pumps should 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.

Base mounted pumps shall be laser aligned. Typically, this should be specified as part of factory service technician start-up services.

For vibration testing requirements, refer to U-M Master Specification Section 15990.

For insulation requirements, refer to Design Guidelines Technical Section 15250.

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