23 21 23 – Hydronic Pumps

1. Introduction

   A. This section pertains to all pumps for use in building systems. Pump motors are discussed to the extent that they affect pump application. Specific design guidelines for pumps in central utility plants are not included and should be considered on a case-by-case basis only after thorough discussion with Duke Utilities & Engineering Services (DUES). Also excluded from this section are pumping systems for specialized laboratory systems, food service, swimming pools or hazardous waste.

   B. Designers should coordinate with Duke Office of Project Management and Duke Utilities & Engineering Services, Department of Planning & Engineering (DUES-Engineering) on all phases of projects requiring pumps and pumping equipment. These projects may include, but are not limited to:

      1. New buildings
      2. Renovations to the existing building
      3. Replacement of existing equipment

   C. Designers are expected to share and review any project data, load calculations and site condition evaluations with DUES-Engineering.

2. References

   A. ASHRAE Standard 90.1-2007

   B. ASME

3. Design Standards

   A. General Requirements:

      1. All pumping system designs must identify energy efficiency, reliability, serviceability, operational functionality and life-safety issues. This information will allow Duke to fully and accurately evaluate the project and its associated Life Cycle Cost (LCC).

      2. All pumping systems should be designed with full n+1 redundancy, unless otherwise indicated during the design process.

      3. Pumping systems should be as closely matched to systems requirements as possible. Designers must consider partial-load situations when selecting for optimal system efficiency. All pump and piping systems must comply with most recent provisions of ASHRAE Standard 90.1.

4. All pumps rated at one (1) horsepower and above shall be equipped with variable-frequency drives (VFDs).

5. All pumps for building services must be installed in dedicated mechanical equipment rooms. Pumps should not be housed in temporary structures or installed in unconditioned spaces.

6. Equip all pumps with suction- and discharge-side pressure gauges and isolation valves. **A single gauge, differential pressure sensing setup is not sufficient.**

7. All pumps must be equipped with proper isolation components, such that the pump may be maintained without service outage to the system.

8. Design all pumping systems with appropriate mechanisms for air separation, air venting and fluid expansion.

9. All equipment must be supported directly by structural members with adequate load-bearing capacity and material integrity, using appropriate anchoring/connection hardware. Under no circumstances may equipment be supported by connections to finish materials. For example, equipment hung from toggle bolts through plaster-on-lath, gypsum board or ACT ceilings is **not acceptable**.

B. Heating Hot Water Systems:

1. HHW pumps should be base-mounted end suction type or in-line type centrifugal pump with bronze rotor and cast iron volute. Provide pump with appropriate guarding for shaft and coupling. See Section 22 30 00 for more information on domestic hot water systems requirements.

   a. Preferred Equipment:

      i. Bell & Gossett Series 1510

      ii. Goulds Model 3196

      iii. Aurora Series 340/360

C. Chilled Water Systems:

1. N/A

D. Condensate Return Systems:

1. Electric Pumps:

   a. Condensate pumps should be part of a packaged-type Condensate Return Unit (CRU). CRU should be duplex-type, cast iron receiver equipped with low-NPSH pumps able to handle fluids at minimum temperature of 210°F. Equip with alternating lead-lag switch, integral to control panel. Pumps must be equipped

with Hand-off-Auto switching capability. CRU pumps should not be equipped with VFD.

b. All condensate pumps must provide a minimum of 45 psig discharge pressure to system.

c. Equip all condensate pumps with flow-limiting devices for matching pump output to system curve. Device shall be Flow Design Inc. model YR flow regulator, factory set to match pump output characteristics.

d. Preferred Equipment:

i. ITT Domestic CB Series

ii. ITT Domestic CU Series

iii. Spirax Sarco “V” Series

iv. Spirax Sarco “G” Series

2. Non-Electric Pumps (Pressure-powered pumps):

a. Condensate pumps should be part of packaged-type Condensate Return Unit (CRU). Receiver tank must be frame mounted and gravity-drainable into pump(s). Pump should be cast-iron body with inlet and outlet check valves.

b. Pump may use medium-pressure steam (MPS) at maximum 75 psig for motive source.

c. Preferred Equipment:

i. Spirax Sarco model PTC

ii. Spirax Sarco model PPEC

iii. Spirax Sarco model APT-14

E. Domestic Cold Water:

1. Reference Design Guidelines, Section 22 11 16, Domestic Cold Water Systems. (Note: Section 22 11 16 is a future section and not currently available).

F. Domestic Hot Water:

1. Reference Design Guidelines, Section 22 30 00, Domestic Hot Water Systems.

G. High-Purity Water Systems:

1. High-Purity Water Systems, such as de-ionized (DI) water, reverse-osmosis (RO) water and demineralized (DEMIN) water, should be designed as needed to meet the criteria of the user. Any utility or building system interface to these high-purity systems must be coordinated with Duke FMD at project outset.

H. Sanitary Sewerage (ejector) Pumps:

1. For new construction purposes, designers are encouraged to avoid the use of sewerage (ejector) pumps wherever possible. However, where lack of gravity drainage capabilities necessitate the use of such a pump, follow the requirements below:

   a. Sewerage pumps should be duplex-type, cast iron-bodied.

   b. Provide pumps with alternating lead-lag switching and high water alarm.

   c. Provide backup/emergency power to sewerage pumps.

I. Building Dewatering (Sump) Pumps:

1. Sump pumps should be submersible, single-stage, end suction pump, close coupled to motor with cast iron casing. Pump must be provided with elevated legs for inlet suction flow and vertical discharge connection.

2. Pump motors should be min. 1/2 hp, single phase 115V power.

3. Pump should be controlled via a mechanical float-type switch. Designers must provide a high water level alarm and provide control point to Siemens Insight campus automation system.

4. Sump pumps in areas that may receive hot water or steam condensate must be rated for high temperature operation, minimum of 140°F.

   a. Preferred Equipment:

      i. Zoeller Company Model M137

      ii. Weil Pump Company model 1412

4. <u>Documentation and Review Requirements</u>

A. Documentation of factors used in equipment selection must be submitted for review at DD submittal and each subsequent submittal if conditions have changed. Summary of factors shall identify which factors are known and which are assumptions.

B. Detailed equipment selection, including expected sound levels.

C. Cost of operations and maintenance shall be included in system Life Cycle Cost Analysis. This information shall be reviewed at DD submittal.

5. <u>Installation and Performance Requirements</u>

A. All units shall be installed level.

B. Permanent installation methods must include provisions for isolating pump vibration from structure. Acceptable methods include:

   1. Spring mount vibration isolation

   2. Concrete housekeeping pads with fully-grouted base

   3. Flexible coupling connection to independently-supported system piping

C. All units shall be installed so that there is sufficient space to perform normal maintenance. This space shall be shown on project drawings.

D. Pump alignment must be performed for all shaft-coupled pumps. This must be performed prior to connecting any electrical power to the pump motor.

E. Coordinate all commissioning efforts with DUES. This includes all testing and balancing of systems, all functional performance tests and any other pertinent data obtained during the commissioning phase of the project.

6. As-Built Requirements

A. Designer must provide drawings showing all equipment locations. Drawings must include final layout, details of all connection points and other pertinent data. Field-applied identification tags and nameplates must match as-built drawings (e.g. “P-1” location on drawings must be “P-1” physical location).

B. Provide operations and maintenance manuals for each pump. Where multiple units are covered by the same manual, duplicate manuals are not required. A list of all equipment, by equipment ID, will be provided in front of each section of the O&M manual, with equipment location and title and publication number of appropriate manual shown for each piece of equipment. Equipment shall include unit capacities.