

## **232000 HVAC Piping and Pumps**

### **Sections Included In This Standard:**

- 1.1 Chilled Water Systems
- 1.2 Steam Distribution Systems
- 1.3 Steam and Steam Condensate Specialties
- 1.4 Refrigerant Piping
- 1.5 HVAC Base-Mounted Pumps
- 1.6 Chemical Water Treatment
- 1.7 Variable Frequency Drives
- 1.8 Protection of Mechanical Room Piping and Outside Piping Insulation
- 1.9 HVAC Piping Components

### **1.1 CHILLED WATER SYSTEMS**

#### **A. GENERAL**

1. The campus is served by several chilled water plants. The chilled water system of each new building shall be designed so as to be compatible with the characteristics of the chilled water plant(s) serving it. New buildings shall have chilled water pumps, variable frequency drives, and connect to the Campus chilled water system with regular fittings welded into the chilled water supply and return lines with individual isolation valves located inside a manhole (no valve boxes). Consult the Physical Plant Division, Utilities Department, Utilities Planning Engineer.
2. Buildings served by a central chilled water plant should not have an expansion tank or an automatic water make-up system. Make provision for flushing and initial filling of the chilled water system, using domestic water.
3. Existing loads on all UF chilled water plants operate at a higher flow-per-ton ratio, under peak conditions, than the chillers are designed for. This results in loss of system capacity and efficiency. In order to help remedy this situation, new chilled water loads are required to have exceptionally low flow-per-ton ratios, or high chilled water return temperatures; the overall average return temperature, under design conditions, should be at least 60° F. This may require some oversized coils, series arrangement of chilled water coils, pre-cool coils for outside air, or other options. The engineer shall select the most appropriate mix of options to satisfy the overall average. The engineer shall also investigate the application of some of the following for energy savings and dehumidification: Tri-coils, heat pipes, enthalpy energy recovery ventilators (fixed plate and wheel), and preconditioned outside air.
4. All buildings shall be provided with shut-off valves within the building where the chilled water supply and return lines enter the building. Provide manual air vents on the plant side of the shut-off valves, thermometers and pressure gauges on the supply and return. Provide the means to drain and vent the building piping, as well as automatic air vents at the high points of supply and return risers.
5. All new and renovated buildings shall be provided with chilled water metering as per Section 250000.

- B. EXECUTION:** All lines shall be cleaned, flushed, pre-treated, and all air vented before water is turned on from the central plant. See also "Chemical Water Treatment" located in this

Section.

## 1.2 **STEAM DISTRIBUTION SYSTEMS**

- A. DESIGN DRAWINGS: Piping design drawings for steam and heating hot water heat exchangers shall include all valves, traps, drip legs, etc. with the intent that this drawing shows all expected equipment and devices.
- B. PIPING
  - 1. Steam: Steam lines shall be a minimum of Schedule 40, black steel pipe.
  - 2. Condensate: Condensate lines shall be a minimum of Schedule 80 steel pipe.
  - 3. Use flexitallic gaskets (not paper) where required for steam and condensate system.
- C. PUMPS AND RECEIVERS
  - 1. Specify a duplex unit. Cast iron receivers are preferred.
  - 2. Acceptable Manufacturers: Hoffman; Sterlco (Sterling)
- D. METERING: All new and renovated buildings shall be provided with steam and condensate isolation valves and a steam meter at the point the lines enter the building (Refer to Section 15950)
- E. SHUT-OFF VALVES: All buildings shall be provided with shut-off valves within the building where the steam supply and return lines enter the building.

## 1.3 **STEAM AND STEAM CONDENSATE SPECIALTIES**

- A. STEAM TRAPS
  - 1. Non-vented traps shall be used on high and low drip leg trap assemblies only. Not on heat exchangers or steam coils.
  - 2. Acceptable Manufacturers: Sarco; Yarway; Velan, Armstrong.

## 1.4 **REFRIGERANT PIPING**

- A. TUBE SIZE THROUGH 1/4": Use hard drawn tempered copper tube.
- B. TUBE SIZE GREATER THAN 1/4": Use hard drawn tempered copper tube.

## 1.5 **HVAC BASE-MOUNTED PUMPS**

- A. ACCEPTABLE MANUFACTURERS: Aurora; Bell and Gossett;
- B. PUMP MOTORS: Provide high efficiency, inverter duty motors.
- C. VIBRATION ISOLATION: All base-mounted pumps shall have the base grouted into the housekeeping pad or installed on spring-mounted housekeeping pads/bases to provide

vibration isolation and to prevent sound from resonating into the piping system.

- D. **SUCTION STRAINER:** All HVAC (chilled and hot water) pumps shall have a self-contained suction strainer to protect the pump from foreign matter or dirt, with a blow down line and a ball valve with plug or a hose fitting with cap to flush debris from strainer. Inline pumps shall have an inline strainer. The suction strainer shall have a removable insulation box around the strainer.

## **1.6 CHEMICAL WATER TREATMENT**

- A. **CHILLED, HEATING, AND CONDENSER (COOLING TOWER) WATER:**  
All chilled, heating, and cooling tower water piping shall be flushed, cleaned, pre-treated, and initially treated by the Builder. Contact the PPD Operations Engineering at Phone: (352) 392-1121 to witness the piping systems' flushing, cleaning, pre-treating, and initial treating, and to coordinate identification, determination of chemical type and quantity needed and purchase of water treatment chemicals. Builder shall purchase these chemicals in the chemical type and quantity needed directly from the Water Treatment Vendor under contract with PPD at the time the system is put into service. The Water Treatment Vendor will supply chemicals at the University contract price, deliver the chemicals to the job-site and invoice the Builder, who shall pay the Water Treatment Vendor for the chemicals delivered. The Builder is required to maintain treatment for all building piping systems during the entire warranty period, providing monthly water sampling and written reports to the A/E with copy of such sampling and reports maintained on the job-site. The Builder's water treatment responsibility for building piping connected the central chilled water and steam systems ends upon PPD agreeing to, and the subsequent connection to the central system. Building piping systems shall be flushed, cleaned and pre-treated prior to introducing water to air handling units, heating units and other terminal equipment (except for use of clean potable water for hydrostatic pressure testing). Initial treatment shall not commence until all operating valves are opened to equipment tied into the building piping system (including air-handling units, heating units and other terminal equipment. No equipment shall be put into service prior to initiation of water treatment. For the latest specific requirements, refer to the PPD website: [www.ppd.ufl.edu](http://www.ppd.ufl.edu).

## **1.7 VARIABLE FREQUENCY DRIVES**

- A. **COMMUNICATIONS:** Variable frequency drives shall be equipped with a serial interface to allow bi-directional communication with the existing controls system and the UF Web based Ethernet WAN with BACnet/IP protocol from the building level controller up to the Web based server operating system.

At a minimum, the following points shall be made available to the controls system: Set Point, Drive Speed (RPM), Frequency (Hz), Current (A), Power (KW), Energy (KWH), Last Fault Number, OK/Faulted Status, Stop/Run Status, and Hand/Off/Auto Status.

- B. **HARMONICS:** Any project installing a VFD into a new or existing system and generating harmonics is required to eliminate such harmonic noise. In order to prevent obtaining such an installation, as part of submittal data, calculations shall be provided to pre-warn of the possibility of the VFD creating harmonics based upon project parameters. If the calculations show the potential for harmonics, solution(s) must be implemented-to include changing the installation, incorporating harmonic suppression filters, etc. to eliminate the problems. If harmonic suppression filters are required, they may be installed either as part of the equipment itself, or ahead of the equipment on the electrical system. Finally, the installation must be

checked to verify the VFD is not generating harmonics. Wiring for the line side of the VFD and the load side of the VFD cannot be run in the same electrical conduit.

- C. ACCEPTABLE MANUFACTURERS: Asea Brown Boveri, Danfoss, Eaton, Yaskawa
- D. WARRANTY: The warranty period shall begin at Substantial Completion for a minimum of 2 years.
- E. APPLICATION: Consider providing VFD's for all motors 3 Horsepower and larger, where the motor speeds can be reduced as conditions change (partload). Consider multispeed motors and Electronically Commutated motors (ECM) for smaller motor applications such as exhaust fans, blower fans, Fan Powered VAV's, and Fan Coil Units.

## **1.8 PROTECTION OF MECHANICAL ROOM PIPING AND OUTSIDE PIPING INSULATION**

Provide heavy-duty jacket for all chilled water supply and return piping, steam piping, steam condensate piping, and insulation up to six (6) feet above finish floor elevation in all mechanical rooms. This jacket shall be smooth aluminum (.016 min) heavy-duty fire retardant material with glass fiber reinforcing, fire retardant PVC (.060 min) thickness for preformed fitting covers, aluminum for straight runs or other heavy-duty covering. Provide a similar jacket for all rubber (Rubatex or equal) insulation exposed outdoors such as AHU condensate piping and DX system refrigerant piping.

## **1.9 HVAC PIPING COMPONENTS**

- A. Piping components shall be required in stand alone chilled water AHUs (Liebert and others) located inside of buildings.
- B. At a minimum, provide the following at each stand-alone AHU, either 3 feet or less outside the AHU or inside of the unit. For the Health Science Center, only piping components located outside of the unit are permitted.
  - 1. Shutoff valves for both supply and return.
  - 2. Chilled water control valve or equivalent.
  - 3. Balancing valve with pressure taps.
  - 4. Pete's plugs on supply and return of coils.
  - 5. For the Health Science Center in place of Pete's plugs, add:
    - a. Install 4" pressure gauges on both supply and return within five feet of unit.
    - b. Install thermometers on supply and return piping within five feet of unit.
- C. Strainers shall be required in all HVAC piping located in Central Plants, distribution piping, and inside of buildings. All strainers shall be installed with blowdown valves and screwed plug or screwed hose fitting with cap.

**END OF SECTION**