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# 231800 - A - District Heating & Cooling Plant Utilities

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## **SECTION 23 1800 – DISTRICT HEATING AND COOLING PLANT UTILITIES**

### 1.1 SUMMARY

- A. The purpose of this standard is to provide design guidelines and requirements for projects which require connection to one of the district heating and/or cooling plant utility systems.
- B. The University currently has 2 district plant systems:
  - 1. Campus District Hot Water System.
  - 2. Campus District Steam and Condensate System.
  - 3. Philbrook Hall Central Chilled Water Plant: This plant generates 42 degree chilled water for cooling existing and new buildings.
- C. Refer to the current University Utility Master Plan for additional information.
- D. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.

### 1.2 DISTRICT HOT WATER GUIDELINES

- A. District heating connections and related BAS controls for space heating are indicted in Attachment A.
- B. District Hot Water Heating Entrance Balancing Valves
  - 1. The main entrance into each building shall have a balancing valve (a.k.a. circuit setter) on the return line to limit flow to the maximum design flow required to maximum heating load (See the drawing in Attachment A to this section).
  - 2. In buildings with multiple secondary pumping loops in the building, a balancing valve shall be installed on each loop.
  - 3. Balancing valves shall be Victaulic TA series 786, 787, 788 or 789, no exceptions allowed. Valves shall be ductile iron, zinc alloy not allowed. Valves shall be 125 or 150 pound minimum rating depending on application.
  - 4. Victaulic pre-fab insulation kits shall be provided and installed on each district heating balancing valve (example insulation kit for 3" balancing valve is Victaulic part number K-030-784-INS).

### 1.3 UNDERGROUND HOT WATER SYSTEM PRE-INSULATED PIPING

- A. Under development.

### 1.4 DISTRICT STEAM AND CONDENSATE GUIDELINES

- A. Under development.

1.5 UNDERGROUND STEAM AND CONDENSATE PRE-INSULATED PIPING

- A. Under development.

1.6 DISTRICT CHILLED WATER GUIDELINES

- A. The designer shall coordinate with the University's Facilities Design and Construction staff on the capacity of each building's chilled water system. Possible future cooling capacity shall be included in the project as determined by the University.
- B. The design shall determine winter cooling capacity needed for the building. Some buildings will need a reduced chilled water flow rate capacity for cooling during the winter. This reduced capacity may be best distributed by smaller alternate distribution pumps rather than by reducing the speed of the main larger distribution pumps.
- C. Individual building chilled water systems shall be separated from the central plant chilled water loop with the utilization of a plate and frame heat exchanger located in one of the building's mechanical rooms.
- D. The project design shall include the following:
1. Connection to the buried distribution lines of the central chilled water system with pre-insulated piping.
  2. Providing utility meter. All meters to be provided by contractors.
  3. Providing a heat exchanger to separate the building chilled water system from the central plant loop.
  4. Providing a building side chilled water distribution system or connecting to an existing chilled water system.
  5. Refer to attached schematic for utility chilled water piping connection layout requirements.
- E. Reuse of Existing Equipment
1. Hydronic equipment for existing chilled water systems shall be reused as much as possible when the equipment is in good working order and is of the capacity required by the new chilled water system.
  2. If the equipment is within three years of the expected service life, the University shall decide if the existing equipment shall be replaced.
  3. All obsolete chilled water components shall be identified, removed, and disposed of in accordance with University requirements identified in this standard.
- F. In general, the building side chilled water distribution system shall have variable speed pumps, two way control valves at the cooling coils, and speed control via differential pressure. Existing chilled water building side distribution systems may be upgraded to include these energy saving features.

1.7 UNDERGROUND CHILLED WATER SYSTEM PRE-INSULATED PIPING

- A. Provide pre-insulated piping by Rovanco Piping Systems, Inc. for underground chilled water supply and return service complete with high-density polyethylene (HDPE) outer casing, polyurethane foam insulation, and steel carrier pipe. Carrier pipes shall be prefabricated and pre-insulated in single or double-r.
- B. Five percent of the welds for buried pre-insulated piping system shall be inspected by x-ray.
- C. Provide steel carrier pipe with field-welded joints. Carrier pipe shall be Schedule 40, ASTM A53, Grade B, ERW for sizes 2" through 10" and Standard Weight, ASTM A53, Grade B, ERW for sizes 12" and larger.
- D. Provide factory foamed-in-place polyurethane foam insulation with the following minimum characteristics:
  - 1. K-factor: 0.130 Btu-in/hr-ft<sup>2</sup>-0F
  - 2. Density: 2.0 pounds per cubic foot
  - 3. ITT Closed Cell Content: 90-95% in conformance with MIL-I-24172 & ASTM C 591 Insulation shall completely fill the annular space between the carrier pipe and outer jacket.
- E. Provide outer jackets of seamless extruded black high-density polyethylene (HDPE). The polyethylene shall be manufactured from polyethylene resin compound qualified as Type III, Category 5, Class C, Grade P23 or P34 in accordance with ASTM D1248 and D3350. PVC or FRP jackets shall not be acceptable. HDPE jackets having less than the specified dimensional requirements shall not be acceptable.
- F. Provide with each length of pre-insulated pipe and exposed ends of fittings watertight mastic end seal at jacket and pipe surfaces. All exposed field cuts will be sealed with a field applied mastic end seal with materials supplied by the manufacturer.
- G. Provide field-applied heat shrinkable end caps, for terminal ends of system, designed to prevent the intrusion of ground water into the insulation medium.
- H. Provide joint insulation and closure materials as factory supplied assemblies consisting of two-part field-applied urethane foam insulation, HDPE sleeves, and heat-shrinkable wrap-around sleeve closures. The installing contractor shall field install joint closures after successful completion of all testing. Pre-formed urethane half-shells shall not be acceptable.
- I. Provide fittings prefabricated and pre-insulated and having the same material and physical characteristics as for the straight pipe sections. Field fabricated and insulated fittings shall not be acceptable.

1.8 STEAM PRESSURE REDUCING VALVES

- A. Manufacturers:

1. Spence, pilot operated.
2. Sarco, pilot operated.
3. Substitutions: As approved by the University.

B. Removable, reusable insulation covers shall be provided for all steam pressure reducing valves.

#### 1.9 PLATE AND FRAME HEAT EXCHANGER

A. Manufacturers:

1. Alfa Laval; [www.alfalaval.com](http://www.alfalaval.com).
2. Trantor; [www.trantor.com](http://www.trantor.com).
3. ITT Standard; [www.ittstandard.com](http://www.ittstandard.com).
4. Substitutions: As approved by the University.

B. Frames: Caron steel with baked epoxy enamel paint, stainless steel side bolts and shroud. Frame to be sized to allow 20% added capacity with additional plates.

C. Plates: Stainless steel type 304.

D. Gaskets: NBRP CLIP-AD.

E. Nozzles: 150 psi rated lined flange type.

F. Insulation: Provide manufacturer's insulation package and drain pan.

G. Warranty: Provide five year manufacturer's warranty.

#### 1.10 METERS

A. BTU metering shall be provided for all buildings connected to the district heating system and for all chilled water systems with a chiller serving multiple buildings.

B. District hot and chilled water BTU metering shall be accomplished with primary supply and return water temperature sensors and a water flow meter. Water flow meters shall be rated for 240 degrees F minimum. Water temperature sensors shall be matched pairs with differential temperature accuracy of at least 0.1 degree F. BAS software shall perform the BTU calculations and log hourly, daily and monthly totals.

C. District steam BTU metering shall be accomplished with mass flow steam meters or with "Cadillac"-type condensate meters and condensate temperature transmitters. BAS software shall perform the BTU calculations and log hourly, daily and monthly totals.

D. Flow Meters

1. Manufacturers:

- a. Panametrics, Inc. model AT868; [www.panametrics.com](http://www.panametrics.com).

- b. Siemens (formerly Controlotron) Model 1010.
  - c. No Substitutions allowed.
- 2. Clamp-on ultrasonic flow meter with 4-20 milliamp signal scaled to GPM. Meter shall be integrated into the University's Building Automation System (BAS).
  - 3. Designer shall provide piping drawings which indicate the necessary fifteen (15) pipe diameters of unobstructed horizontal piping with no wells, valves, elbows or other obstructions for the mounting of the flow meter transducers. Vertical pipe with flow up is also acceptable, but vertical pipe with flow down is unacceptable.
  - 4. Flow meter shall include mounting bracket and clamp assemblies. Flow meter shall be insulated in a manner that prevents condensation formation, but allows easy removal and reinstallation for period cleaning and servicing.

#### 1.11 SALVAGING OF REMOVED EQUIPMENT

- A. The mechanical contractor shall provide the University, the manufacturer, model number, nominal capacity, and salvage value of all major equipment to be removed as part of this project. The University shall determine the disposition of this equipment. For refrigeration equipment, the contractor shall provide the University the type and estimated quantity of each refrigerant. UNH Facility Operations and Maintenance reserves the option of recovering refrigerants from all equipment being removed by outside contractors.

END OF SECTION 23 1800

#### ATTACHMENTS:

Attachment A - District Heating Water Connections and Controls