

## **PART 1 - GENERAL**

These standards and procedures apply to the design and installation of hot water heating system and accessories.

### **1.01      DESIGN CRITERIA**

#### **A. Drawings and Specifications:**

1. Indicate unit dimensions, weight loading, required clearances, electrical characteristics and connection requirements.
2. Include equipment schedules: Identification tag, capacities, balancing requirements, electrical requirements, weights, etc.
3. Indicate control valves and DDC control panel locations.
4. Provide heating water flow diagram (heat exchangers, pumps, piping distribution, sizes, coils, flow, etc.).
5. Provide valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
6. Provide isolation valves on all equipment. Locate valves, control valves, balancing valves and control components for accessibility. Provide enlarged plans or section drawings as required to show valve heights.
7. Piping shall be provided with complete drainage of system with hose bibbs at low points.
8. Provide floor drains or sinks (with trap primers) near equipment for drainage, relief valve discharge and air vent discharge.
9. Provide automatic air vents to all high points of system. Pipe to floor drain.
10. Safety/Relief Valves: Pipe to floor sink. For steam and hot water system relief valve provide insulation required to provide personal protection as required by OSHA.
11. Pipe Expansion: Indicate pipe expansion loops, guides and anchors.
12. Testing: Hydrostatic testing at 150-percent above maximum operating pressure or 100 psi minimum, whichever is greater.

**B. Design:**

1. Piping: Size piping distribution system with future capacity provided at pumping assembly. Maximum water velocity = 8-feet per second, maximum water pressure drop 4-feet per 100 lf.
2. Hot Water Heating: Design for 180oF heating water capacity. Coils shall be sized for 160oF entering water and 20oFΔt.
3. Expansion Compensation: Designer is required to provide design of piping systems , including mains, branches, risers and run-outs, with sufficient offsets to allow for free expansion and contraction, and sufficient to prevent leaks and over-stressing of piping system. Provide expansion compensators where required when offsets are not adequate for free expansion and contraction, in accessible locations to allow for servicing or replacement. Provide expansion joints schedules on drawings.
4. All hot water heating piping systems shall be designed and constructed to meet ASME B31.1 Power Piping.
5. All heating hot water systems shall be tested for minimum of 2 hours at 1-1/2 times design working pressure or 150 psig, whichever is greater.
6. Controls: Direct Digital Controls shall be utilized. Heat exchanger, air handling unit coil valve actuators shall be pneumatic with existing compressed air system extended. Terminal unit and unit heater control valves shall be electric.
7. Vibration Isolation and Seismic Restraints: Provide vibration isolation and flexible connectors at pump assemblies with seismic restraints. Secure unit, components and accessories in accordance with seismic requirements per code.
8. Do not use the following:
  - a. Grooved piping.
  - b. Dielectric Unions.
  - c. Cabinet Unit Heaters.
  - d. Steam Heating Coils.

**PART 2 - PRODUCTS**

**2.01      PIPING**

- A. Heating Water Piping 2-inch and smaller: ASTM B88 Type “L” hard drawn copper.
- B. Heating Water Piping 2-1/2-inch and larger: ASTM A53, Schedule 40, Grade B, electric resistance welded or seamless, black steel.

**2.02      FITTINGS**

- A. 2-inch and smaller: Wrought copper solder fittings and screwed adapters, ANSI B16.22. Cast bronze solder joint fittings and screwed adapters, ANSI B16.18. 95 percent tin, 5 percent antimony solder, ASTM B32.
- B. 2-1/2-inch and larger: Wrought-Steel, ASTM A 234/A 234M, butt-weld or flanged.
- C. Dielectric nipples threaded or sweat, (unions not allowed) required at dissimilar metal junctures.

**2.03      UNDERGROUND SUPPLY AND RETURN PIPING**

Provide piping in accessible utilidor or tunnel. Do not use manufactured conduit system or pre-insulated piping without prior approval.

**2.04      HYDRONIC SPECIALTIES**

See Section 200300 “Basic Materials and Methods.”

**2.05      VALVES**

See Section 200400 “Valves For HVAC And Plumbing.”

**2.06      HOT WATER PUMPS**

See Section 231123 “Pumps.”

**2.07      HEAT EXCHANGER**

See Section 232200 “Steam and Condensate Systems.”

**2.08      DUCT COILS**

ARI 410, counter-flow, seamless copper tube with mechanically bonded aluminum fins, 10 fins per inch (maximum), galvanized steel casing. Coils shall consist of two rows minimum.

**2.09      FINNED PIPE RADIATION (Use is severely restricted – contact AV/F&I)**

- A. Manufacturers: Trane, Dunham Bush, Sterling.
- B. 1-inch nominal seamless copper tubing with aluminum fins, hangers for free expansion at 4'-0" on centers. 16 gauge steel cover complete with access panels and end caps. Run covers wall-to-wall or column-to-column.

**2.10      UNIT HEATERS**

- A. Manufacturers: Trane, Dunham-Bush, Modine.
- B. Propeller unit heaters suspended type, quiet in operation. Provide air deflectors. Heating coils non-ferrous alloy, free to expand or contract.

**2.11      METERING**

See Section 200920 "Direct Digital Controls."

END OF SECTION