

1. This information provides guidelines for the design and construction of steam and heating water systems within buildings. Additional requirements for the high pressure steam distribution systems, chilled water systems, domestic water and temporary facilities and controls are covered in other parts of these standards, or are available from the Facilities Management project representative. Reference "General Mechanical Requirements" standard for overall mechanical system design guidelines.
2. Facilities Management project representative, Facilities Maintenance, Public Safety Office and Environmental Health and Safety Office, shall approve selection of materials, means and methods. Unless otherwise approved, the design intent requires means and methods that provide minimal disruption to adjacent building activities and operations.
3. When working in or adjacent to occupied buildings, require means and methods that protect occupants from exposure to noise, dust, traffic and other hazards.
4. Facilities Management project representative shall inform Facilities Maintenance and other campus departments or groups affected by the work.
5. General:
  - a. All components requiring periodic maintenance or observation shall be readily accessible.
  - b. Steam lines shall be sloped to drip legs to eliminate the accumulation of condensate and dirt at control valves and pressure regulating valves.
  - c. Condensate return lines shall be located below equipment in all cases to allow for gravity draining of all condensate. Prohibit siphon traps.
  - d. Provide "Y" type strainers upstream of steam traps and control valves.
  - e. "Y" type strainers shall have nipple and ball valve (with plug) in blow down connection with union to floor drain.
  - f. Provide a makeup water meter that measures in gallons in the makeup line to the heating water system.
  - g. Steam and heating water piping design shall consider expansion at penetrations through concrete walls and floors.
  - h. Pipe all relief valves and automatic air vents to a floor drain.
6. Piping – "See Basic Mechanical Methods and Materials."
7. Steam pressure reducing station (PRV Station):
  - a. Require two pressure regulating valves in parallel sized at 1/3 and 2/3 proportion of maximum flow.
  - b. Preferred manufacturer for pressure regulating valves: "Leslie," class GPB or GPK.
  - c. Pressure regulating valves shall be sized to handle design load at an incoming steam pressure of 100 psi (689 kPa). Outlet pressure of regulating stations shall be a maximum of 15 psi (103 kPa). See "General Mechanical Requirements" for additional requirements.
  - d. Pressure regulating valves having balance, pilot and impulse lines affected by steam turbulent flow shall be sized and configured and installed to the manufacturer's recommended instructions upstream or downstream of piping runs.
  - e. Valve operation shall be controlled through the University's BAC network.

- f. PRV stations shall be designed, sized and installed in complete accordance with manufacturer's recommended instructions and good ASME safety relief and regulating practice and noted as such on contract documents.
  - g. Provide isolation valves to allow maintenance of pressure reducing station valves and components without shutdown of the heating system. No bypass with throttling valve.
  - h. Provide pressure gauges upstream and downstream of the pressure regulating valves.
  - i. Provide an iron body "Y" type strainer with 40 mesh stainless steel screen upstream of all pressure regulating valves.
8. Steam traps and drip legs:
- a. Preferred manufacturer: MEPCO, Armstrong.
  - b. Preferred type: Inverted bucket trap, float and thermostatic, thermodynamic.
  - c. Select type of steam trap and capacity for the application. Consider warm-up loads, start-up load and running load when sizing. Provide rationale and calculations for sizing and selection to the Facilities Management project representative.
  - d. Provide a "Y" strainer upstream of the steam trap.
  - e. Provide a test tee with test valve and check valve downstream of the steam trap.
  - f. Provide adequate isolation valves and unions for removal and repair of components.
  - g. Provide drip leg diameter and length appropriate for the application. Provide boiler drain valve at bottom of drip leg.
9. Steam heating coils:
- a. Provide pressure rated vacuum breaker at high point of steam coils, so that coils shall drain and avoid water hammer.
  - b. Provide a steam trap to assure adequate draining of the coils.
10. Hot water heating coils:
- a. Provide readily accessible manual or automatic high point vent at all coils.
11. Condensate return pump and receiver:
- a. Provide a duplex condensate pumping unit with cast iron receiver, stainless steel pump shaft, two (2) float switches, mechanical alternator mounted on a common base.
  - b. Condensate receivers shall have a high level alarm connected to the BAC system.
  - c. Size the pump to be capable of returning condensate to the Central Steam Plant. Provide calculation and verify final capacity with Facilities Management project representative and the Utilities Manager.
  - d. Condensate units shall have factory installed high limit dry contacts available to the BAC.
  - e. Provide readily accessible labeled disconnect switches for all pumps.
  - f. Provide unit with readily available interchangeable parts for servicing.
  - g. Preferred manufacturers: Bell & Gossett, ITT Domestic, Hoffman.
12. Condensate meter
- a. In the discharge piping of the condensate pump, provide a condensate meter rated for 250° F with 10 pulse per gal capacity, transmitter and register with read-out.
  - b. Preferred manufacturer: Badger Meter, Inc, Model: Badger Turbo Turbine Meter, 2".
  - c. Install the meter with adequate lengths of uninterrupted piping on both sides of the meter per the manufacturer's recommendations.
  - d. Install the meter in a low point so pipe is full of water at all times.

- e. Provide a 3 valve by-pass around meter including meter isolation.
  - f. Provide a ¾" dia. (18.7 mm) test valve upstream of the meter with garden-hose connections.
  - g. Install the read-out in a readily accessible location. If the meter is located where it is difficult to read, install a remote read-out on mechanical room wall at eye level.
13. Steam to hot water converter:
- a. Provide a U-tube heat exchanger with steam in the shell and water in the tubes. ASME construction for 125 psi (861 kPa) design pressure at 375 degrees F (190°C). Include vacuum breaker and hold down straps. Provide seismic restraints and supports.
  - b. Provide National Board registered pressure vessels. Require certification by the State Boiler Inspector prior to final acceptance.
  - c. Prefer one converter sized at 100% capacity with no redundancy.
  - d. Provide adequate space and piping arrangement (flanges, unions, elbows) to remove tubes for cleaning.
  - e. Provide a steam trap sized for the condensate to be drained at full load.
14. Expansion tanks:
- a. Preferred manufacturer: Amtrol AX series.
  - b. Require steel ASME rated to 125 psig, pre-pressurized, diaphragm expansion tanks. Tanks shall be permanently marked with required charging pressure. Include a gauge and drain valve in heating water piping to tank.
  - c. Provide pressure relief valve and tank drain valve piped to a floor drain.
15. Water distribution pumps:
- a. Require single stage centrifugal pump, base mounted end suction or close-coupled inline configuration, 1800 rpm or less.
  - b. Require premium efficiency totally enclosed fan cooled (TEFC) pump motors. TEFC motors shall be coordinated with rotation of equipment for sound reduction.
  - c. Provide readily accessible labeled disconnect switches for all pumps.
  - d. Pumps shall have mechanical seals and drip-proof motors.
  - e. Pump internals shall be capable of being serviced without disturbing piping connections.
  - f. Base mounted pumps shall include pump, flexible coupling with guard, and motor mounted on a common base.
  - g. Preferred manufacturers: Bell & Gossett (B&G), Armstrong, Taco.
  - h. Standby pumps shall be provided for all main pumps. Main and standby pumps shall be alternated by the BAC.
  - i. Each pump shall be isolated with manual valves and unions or flanges for removal without draining the system. Flanged iron ball valves may be used.
  - j. Provide balancing valve with manufacturer's recommended straight pipe dimension upstream and downstream. System balancing valve shall not be used for isolation valves.
  - k. A drain valve shall be provided for each pump, with a male hose end adapter.
  - l. Check valves shall be provided in the pump discharge.
  - m. Provide inlet and outlet pressure gauges with snubbers at pumps and across strainers.
  - n. Provide a "Y" strainer or a suction diffuser with strainer at intakes of pumps. Provide a disposable startup strainer and a regular strainer.
  - o. Provide flexible pipe connectors in the suction and discharge piping. Connector to be braided stainless steel 316.

- p. Provide overhead clearance and supports necessary to lift motors (e.g. steel support or eye bolt at ceiling).

16. Closed loop water treatment:

- a. Install a 5 gallon chemical bypass feeder with filter across the inlet and outlet of main heating water pumps in the mechanical room. Provide isolation valves and drain connection. Pipe the drain to a floor drain.
- b. Preferred manufacturer: J.L. Wingert, Chem-Aqua "Aqua Pass".
- c. Provide for use with University standard chemical, Savrite RCW-100.
- d. Provide a 50 micron filter for initial startup. Provide a 20 micron cartridge filter for normal operation.

End