Basis of Design

This section applies to the design and installation of hot water heating systems to appropriately interface with existing resource utilities / systems.

Programming

- Design temperatures shall be as established by the City and State Energy Codes. Design temperatures for remote off campus areas will be set by the local code authority or the State code. Consider energy conservation in all aspects of building design at the UW. It must be a goal of the mechanical design to minimize annual operating costs. Mechanical systems must operate efficiently at partial and full load, both at the time of building occupancy and into the future.
- Establish laboratory and research space temperatures as part of the technical programming process. Design unoccupied spaces, including mechanical and electrical rooms, to be heated to 40° F for freeze protection. List all space temperatures differing from the 68° F set point in the final programming document.

Design Criteria

- New hot water converters shall be on a reset schedule. Confirm existing reset schedule. Reset converter and radiation water temperatures by the outside air temperature. The normal reset schedule for a converter is to reset the water temperature from 180° F to 140° F as the outside air temperature changes from 20° F to 70° F respectively. The normal reset schedule for a radiation system is to reset the water temperature from 180° F to 100° F as the outside air temperature changes from 20° F to 70° F respectively.
- Provide hot water heating radiation systems in areas where people are located adjacent to the outside wall. Examples of this type of occupancy are perimeter office areas and study carrels in libraries. Radiation systems will not be required in lab areas, auditoria, or other areas where people will not be seated along the exterior wall. Size radiation systems for 80% of transmission losses. Select finned pipe radiation to extend for the entire length of each glass area. If the perimeter heat loss does not exceed 250 BTUH/LF, radiation may be omitted.
- Provide separate pumps and decoupled distribution systems for radiation systems and reheat coils. Discuss with Campus Engineering if the systems are too small to justify separate systems. Stand-by pumps are required for critical systems. Please discuss standby requirements with Campus Engineering and the Project Manager.
- Reheat coil hot water is normally set at 140° F. If the air temperature to the coil is constant and the skin loss is taken care of by the radiation system, then this temperature does not need to be reset.
- Night setback temperature control is required to protect the building and the equipment inside. Buildings with wood floors or equipment that would be affected by humidity (wood expands) should not be allowed to drop below 55° F. Temperatures below 55° F have caused wood floors to buckle and pianos to go out of tune. For some buildings, a night setback temperature of 40° F, for freeze protection only, will be acceptable. Discuss with Campus Engineering and the Project Manager.
- Provide two-pipe down feed design on hot water heating systems.

- Buildings off campus, including remote sites, should be heated with boilers or furnaces. Availability of fuels will need to be investigated. Discuss fuel options with Campus Engineering.
- Provide pipe test ports/wells to measure pressures and temperatures at each piece of equipment.
- Indicate all systems diversities that the balancer must account for in the completion of the work.

Design Evaluation

The following information is required to evaluate the design:

- Programming Phase: Provide a narrative to describe room temperature setpoints as outlined in the Basis of Design – Programming section.
- Schematic Design Phase: Identify all systems, and include single line system flow diagrams, shaft locations, design calculations, and energy balances. Special occupancy zones must be called out and systems identified.
- Design Development Phase: Provide updated single line system flow diagrams, equipment layout and access requirements, equipment schedules, design calculations, and an outline of specifications.
- Construction Document Phase: Provide final single line system flow diagrams, equipment layout and access indications, equipment schedules, design calculations, and specifications.

Construction Submittals

- Provide industry standard submittal requirements.

Related Sections

- Facilities Services Design Guide – Mechanical - General Requirements
- Facilities Services Design Guide – Mechanical - Heating, Ventilating and Air Conditioning
  - Steam and Condensate
  - Air Handlers and Ventilation Fans
  - Coils
  - Ductwork and Duct Accessories
  - HVAC and HVAC Piping Pressure Testing
- Facilities Services Design Guide – Mechanical - Piping, Valves & Accessories
- Facilities Services Design Guide – Mechanical - Hangers and Supports
- Facilities Services Design Guide – Mechanical - Pumps
- Facilities Services Design Guide – Mechanical - Motors and VFDs
- Facilities Services Design Guide – Mechanical - Metering and Gauges
- Facilities Services Design Guide – Mechanical - Nonstructural Component Seismic Design

- Facilities Services Design Guide – Mechanical - Identification
- Facilities Services Design Guide – Mechanical - Insulation
- Facilities Services Design Guide – Mechanical - Water Treatment and Flushing
- Facilities Services Design Guide – Mechanical - Noise and Vibration Control
- Facilities Services Design Guide – Mechanical - Environmental Control Systems
- Facilities Services Design Guide – Mechanical - Testing, Adjusting and Balancing
- Facilities Services Design Guide – Mechanical - Commissioning

Products, Material and Equipment

- Provide product, material and equipment info here.
- For heating water piping, see Piping, Valves and Accessories section.
- For systems that require freeze protection, provide Dowtherm SR-1, or an approved equal. Approved equals must have been approved by the city for disposal in the sanitary sewer system and must have comparable levels of corrosion inhibitors, heat transfer efficiency, and viscosity.
- Hot water converter selection should include a 0.001 waterside fouling factor.
- At the high points in the water systems provide automatic air vents with a cast iron body, copper ball float and needle, or ball-type air valve. Provide manual air vents on zone heating coils. Provide automatic air vents on pre-heat heating coils. Provide low point drains on hydronic systems.
- Surface mounted convectors must have sloping top. Avoid custom enclosures.

Installation, Fabrication and Construction

- Provide sectionalized down-fed hot water piping systems with isolating and drain valves to simplify servicing without draining large volumes of water during routing maintenance and repair.
- Allow space for tube removal on each hot water converter.
- Do not install cast iron radiation, finned radiation, and air heating coils on the same pumped circuit.
- Provide a hose end drain valve on each hot water coil.
- Provide isolation valves at all air vents.
- Locate expansion tanks at the highest point possible, and fit with gauge glass, drain, vent, and shut-off valve.
- Provide control valves on convectors and radiation; dampers will not be accepted.
- Provide isolation valves with rising stems at the inlet and outlet of each AHU or supply fan coil, or other major component. Locate valves so that each unit, and its control valve, can be serviced without draining an entire system or riser.

END OF DESIGN GUIDE SECTION