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

- 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 a minimum of 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 Engineering Services if the systems are too small to justify separate systems. Stand-by pumps are required for critical systems. Please discuss standby requirements with Engineering Services and the Project Manager.
- Reheat coil hot water is normally set at 140° F.
- 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 Engineering Services and the Project Manager.
- Provide two-pipe down feed design on hot water heating systems.
- 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.
- Each hydronic heating system shall have a pot feeder, coupon rack and make-up water meter. See Metering and Gages section for meter information.
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.

Products, Material and Equipment

- For heating water piping, see Piping, Valves and Accessories section.
- For systems that require freeze protection, provide propylene glycol.
- 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 to prevent materials from being placed/stored on top of the enclosure and blocking airflow. 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 maintenance and repair.
- Allow space for tube removal on each hot water converter.
- Provide relief valves on each hot water converter in compliance with the Boiler and Pressure Vessel code.
- 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