220000-H: SUPPLEMENTAL PLUMBING DESIGN (15450-H)

Related Sections

Basis Guideline: 220000 – “Plumbing Design”
220010-H – “Supplemental Plumbing Specialties”
230900-H – “Mechanical Systems Controls”

For an explanation of the use of these guidelines, see “Design Guidelines for UMHHC Facilities”

General

See Design Guideline 220010-H - “Supplemental Plumbing Specialties” for issues concerning domestic water quality problems.

Hot Water Heaters

All facilities served by the City of Ann Arbor water utility (or other hard water utilities) shall utilize a semi-instantaneous, helical heat exchanger. Heater design shall utilize a precision steam valve control to maintain adequate hot water delivery to facility, rather than utilizing master mixing valves. Mixing valves shall NOT be utilized in domestic hot water production. These valves have exhibited a high failure rate due to domestic water quality and are a source of numerous bleed thru problems throughout campus.

For all UMHHC facilities with direct connections to the campus tunnel system, the primary domestic hot water source shall be the Central Campus Power Plant (CPP) HW loop. The CPP HW enters each facility at approximately 125 °F.

In addition to the CPP HW connection, facilities with inpatient care use shall be provided with normally idle, local domestic hot water heaters, capable of meeting the HW demand upon loss of the CPP HW service.

Facilities with a CPP HW service shall incorporate the following heater design:

- Multiple heater configurations should be provided:
  - One heater should be devoted to maintaining hot water return losses.
  - A second heater(s) should be sized to provide 100% of the building hot water load. This heater(s) shall be for backup use only and shall be normally valved off from its steam source. Full flow thru heater(s) should be maintained at all times. Larger HW demand facilities should utilize multiple heaters in order to maintain HW setpoint accuracy thru the full range of expected HW flows.
  - A third heater configuration, if required, shall utilize (2) redundant heaters to meet high temperature (i.e. 140 °F) hot water demand (i.e. kitchen use).
- HW heater design shall be based on the use of a semi-instantaneous, steam-to-hot water heat exchanger design utilizing a helical heat exchanger.
- Heaters shall be sized based on actual minimum steam pressure expected at control valve. A/E to confirm minimum steam pressures in existing buildings. See DG SID 4.6 “UTILITIES FOR UNIVERSITY BUILDINGS” for minimum steam pressures for new facilities.
- See design guideline 230905-H for a list of DDC points to be monitored thru the BMS. Provide a local color touchscreen Human Machine Interface (HMI) mounted in a temperature control panel in the vicinity of the heaters. See masterspec 230905 for HMI requirements. HMI shall serve to give a local, visual indication of critical CW/ HW conditions.
- Provide valve tags and a wall mounted sign mounted next to the heaters with instructions on how to manually activate the back-up heater(s) in the event of a loss of CPP HW service.

All UMHHC facilities without tunnel services shall be provided with local, natural gas-fired domestic hot water heaters. Hot water system design shall at a minimum utilize multiple heaters with partial redundancy (i.e. 2 heaters sized at 60% each). Facilities housing inpatient care or ambulatory surgery care shall utilize multiple heaters with full redundancy (i.e. min 2 heaters sized at 100% each). Larger
HW demand facilities should utilize multiple heaters in order to maintain HW setpoint accuracy thru the full range of expected HW flows.

**Water Booster Pumps**

Booster pumps shall be sized to provide N+1 capacity based on maximum system demand.

Pumps shall be VFD driven and shall not utilize backpressure valves. Pumps shall be multi stage type and all stainless steel construction. All piping and hydronic specialties (valves, etc) on the pump package shall conform to UMH standards. Each pump shall utilize a dedicated VFD. Integrate pump package and provide DDC points into the BMS per DG 230905H.

AE shall give special consideration to the need to service booster pumps while maintaining domestic water service to the facility. Designs utilizing HW & CW booster pumps located upstream of HW heaters with normally-closed, valved cross-connects between HW & CW systems should be provided. This allows one booster pump package to serve both hot & cold water demands during a short-term maintenance shutdown of a booster pump package. In addition, provide a full-size valved bypass around all water booster pump systems for maintenance.

**Distribution**

UMH has experienced numerous problems with domestic water distribution designs that utilize a single riser with pressure reducing valves (PRV's) on lower floors. PRV’s have proven to be unreliable and should be avoided in plumbing systems designs. UMH prefers separate, independent domestic water risers (lower floors on city water pressure, upper floors off booster pumps) where a single riser would exceed maximum allowable pressures.

In addition, the A/E shall ensure that maximum water pressure limitations for various equipment served by domestic water is not exceeded, including ice makers (typically 60 psi max), cooling tower floats (typically 50 psi max), medical equipment, etc. Provide local PRV’s on all pressure-sensitive equipment.

All PRV’s used in domestic water designs shall be all stainless steel and utilize a full size valved bypass.

Domestic hot water distribution shall ensure timely service of HW to all plumbing fixtures. All domestic hot water distribution systems shall utilize a hot water return system to recirculate hot water to the farthest hot water need, ensuring adequate HW temperature is maintained in the HW main. Branches off the HW main exceeding 20 ft shall be provided with HW return circulation.

Hot water return systems shall utilize an all bronze or stainless steel centrifugal recirculation pump, complete with hydronic specialties (balance and ball valves, thermometer, etc.). Provide a check valve with hose end blow-down valve on strainer leg at inlet of pump to allow HWR loads to be dumped to drain in order to isolate and service pump, while maintaining HW service. Larger HWR designs shall utilize multiple HWR pumps with independently piped HWR loops, matched to the HW supply distribution (one HWR pump to serve the lower floors off city water pressure, a second HWR pump to serve upper floors served off booster pumps, etc). Provide a circuit setter, check valve and temperature gauge at all HWR branches off the riser (min 1 per floor).

**Water Treatment**

City of Ann Arbor water has proven to detrimental to the reliability and ongoing operations of various specialized equipment like sterilizers, cart washers and kitchen equipment. Confirm with users and equipment manufacturers on use of local filtration, water softeners or RO/DI systems.