PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses domestic cold, hot and hot water return distribution systems within and to five feet beyond building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Domestic water shall be provided for all plumbing fixtures, food service fixtures and equipment, and all other systems, equipment, and devices that require domestic water supply.

B. Building domestic water distribution systems shall be metered and isolated from the municipal water supply in accordance with the municipality's requirements. Provide a separate sub-meter for irrigation water supply. In buildings with retail areas sub-metering domestic water should be considered. MDACC to give direction.

C. Domestic water system design and material selection shall incorporate Legionella risk reduction measures recommended by ASHRAE Standard 188 and FGI Guidelines.

D. The design of building supply and distribution systems shall provide a volume of water at the required flows, pressures and temperatures to ensure safe, efficient and code compliant operation during periods of peak demand. Piping shall be sized at a velocity not exceeding six feet per second (fps) for cold and hot water and four fps for hot water return.

E. Main distribution piping risers shall utilize chases within the building footprint for vertical routing to multiple floor levels where possible. Accessible shut-off valves shall be provided at the base of each riser and at each branch connection to risers.

F. Do not locate water piping within stairways, over or proximate to electrical or telecommunications rooms, Cath Labs, Operating/C-section Rooms, Radiology Rooms, or other rooms with high value equipment susceptible to water damage. The use of shields or drain pans to protect the above systems is not allowed.

G. Interior cold water piping shall be insulated to prevent condensation. Interior hot water piping shall be insulated as required by code and per latest ASHRAE Standard A90.1 Table 6.8.3.

H. Provide water softener systems to reduce hardness as required to supply food service equipment, water heating equipment, pure water production equipment, and other systems, fixtures and equipment which hard water may adversely affect operation or longevity. Water

with a hardness of more than two grains per gallon shall not be delivered to equipment requiring softened water.

I. Provide freeze-proof wall hydrants on exterior walls a maximum of 150 feet apart, at loading docks, near building entrances, at mechanical yard and within 50 feet of exterior grease interceptors. Hydrants should be located at approximately 18 inches above finished grade. Coordinate the location of all wall hydrants with the architectural features of the building and obtain approval of locations from the Project Architect.

J. Provide freeze-proof wall hydrant on at least one exterior wall of each roof penthouse. Coordinate with Owner to verify location of additional hose bibs that may be required to

provide a water source for each 10,000 square feet of roof area to accommodate maintenance efforts.

K. Provide a hose bibb with backflow preventer and a minimum of one floor drain in each mechanical room.

L. Provide manufactured water hammer arrestors in water supply lines in accordance with Standard PDI-WH201.

M. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.

N. Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the domestic water distribution system and connected components. Locations shall include but not be limited to the following; at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, at each battery of fixtures, where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system. Accessible capped valves shall be provided where required for future connections.

P. All valves shall be accessible for operation and servicing. Provide access panels for all concealed valves. Coordinate the location of access panels with the architectural features of the building and obtain approval of locations from the Project Architect.

Q. Trap Priming devices that rely upon line pressure differential for activation are not allowed. Each electronic trap primer device shall be provided with a readily serviceable strainer immediately upstream of the device solenoid valve.

2.02 SYSTEM PRESSURES

A. Lower building levels may utilize municipal water system to a height allowed by verified available minimum pressure but shall not serve areas exceeding thirty feet above street grade elevation.

B. Static pressure at plumbing fixtures shall be limited to 55 psig (preferred), 80 psig (maximum), on each floor level by accessible pressure regulating valves. Provide additional pressure regulating valves as required for proper operation of individual equipment.

C. Pressure reducing valves shall be duplexed full-size where located within domestic water lines serving in-patient areas, critical research areas, and/or any area or equipment where uninterruptible (24 hour) water service is required.

D. Provide isolation valve, strainer and pressure gauge immediately upstream of each pressure regulating valve. Provide pressure gauge and isolation valve immediately downstream of each pressure regulating valve.

E. Design of pressure regulating assemblies shall incorporate prevention of over pressurization of downstream piping in the event of valve malfunction. Utilize pressure relief valves only where maximum flow discharge can be evacuated without causing water damage. Automatic solenoid shut-off valves may be provided in lieu of relief valves where approved by Owner. Automatic shut-off valves shall be connected to the building automation system to annunciate activation.

2.03 PRESSURE BOOSTING SYSTEMS

A. Where municipal system pressure is inadequate, a packaged domestic water booster pump system shall elevate the incoming water pressure as required to serve fixtures and equipment. Selection of pumping system type shall be based upon flow and pressure demand, efficiency of operation, life expectancy and maintenance requirements of the equipment.

B. Specify variable frequency drives for booster pump systems requiring five horsepower and greater motors and when considered applicable by the A/E and approved by Owner.

C. Specify constant speed pressure regulated type booster systems when required pump motors are less than five horsepower and when considered applicable by the A/E and approved by Owner.

D. Booster pump systems shall be designed to deliver calculated peak flow at required pressure with one pump out of service.

E. Connect booster pump system to emergency power source.

1. Exceptions: Office buildings or where the Owner does not consider this a requirement.

F. Booster pumps installed within the City of Houston shall draw water from a domestic break tank provided in accordance with City of Houston requirements.

1. Domestic tank may be combined with fire pump water storage if deemed practical. There shall be a dividing double wall partition between the domestic water and fire water.

2. The domestic surge tank coating shall be NSF approved for potable water and sized based upon available incoming water flow rate and pump demand. Domestic water storage shall not be less than twelve hundred gallons and divided into two compartments to prevent disruption of service during maintenance on fill valves, tank coatings, etc. (Note: Two separate compartments for domestic water may be a single compartment where deemed not required on a specific project, contingent on Owner approval.)

3. Electrical power serving tank level control and monitoring shall be from emergency source.

4. Provide block valves on domestic tank fill lines when tank overflows cannot discharge by gravity onto grade through an exterior wall. Block valves should be normally open and close when energized by tank high water level switch. Electrical power serving tank level control and monitoring shall be from emergency source.

5. Provide two fill valves for each water storage compartment. Provide individual manual shutoff valves and drain valves to isolate each compartment for servicing.

6. Provide full line size valved bypass around block and fill valves for each tank compartment to allow manual filling.

7. Provide valves with blind flanges for future temporary bypass around break tank to accommodate tank servicing.

    a. Provide one valve with blind flange on domestic tank fill line upstream of fill valve isolation valve. Valve shall be same size as the domestic water booster pump suction connection.

    b. Provide one valve with blind flange on booster pump suction pipe. Valve shall be same size as the domestic water booster pump suction connection. Locate valve the proper distance from pump suction connection to allow proper operation of pump.

2.04 DOMESTIC HOT WATER SYSTEMS

A. Domestic hot water systems shall be designed to reasonably assure an expeditious flow of hot water at all outlets. Provide a hot water return loop at each floor with balancing valve on tie-in to riser. Provide pumped circulating systems with temperature on/off controls where required. Electric heat maintenance cable may be utilized only when considered applicable by the A/E and approved by Owner.

    1. Size hot water return lines by the heat loss method as outlined in the ASHRAE Guide and Data Book, not to exceed 10 degrees F. heat loss. Developed length of branch piping from fixture outlet to circulated mains shall not exceed 20 feet (Refer to Exceptions in the following sub-paragraphs):

        a. Hot water piping serving public lavatory faucets shall be circulated to within eighteen inches of the fixture hot water supply stop.

        b. A single point-of-use instantaneous electric water heater shall serve no more than three lavatory faucets. The length of hot water piping from the heater to each faucet stop shall not exceed thirty-six inches (36”).

B. Water heaters installed and utilized for food service areas shall comply with National Sanitation Foundation (NSF) Standard Number 5 and be separate from water heating equipment and piping serving other areas of the building. Hot water serving food service commercial dishwasher and food service sink shall be 140 degrees F, sinks used for hand washing shall have a maximum hot water temperature of 110 degrees F.

C. Hot water heating equipment serving areas other than food service may be generated by centralized heaters or point-of-use heaters as determined by economics, space requirements and good engineering practices. All hot water shall be 110 degrees F. maximum at plumbing fixture outlets.

1. Separate water heating equipment should be considered to serve equipment and/or processes that require water temperatures that exceed 110 degrees F.

2. Separate water heating equipment and circulation pumps shall be provided for each pressure zone within a high-rise building. A/E may recommend and submit alternative designs for Owner approval provided that the design insures total circulation of the distribution system.

D. Where centralized heaters are provided, utilize semi-instantaneous type with steam to hot water or hot water to hot water double wall heat exchangers. Natural gas fired heaters may be provided where natural gas service is readily available and when considered applicable by the A/E and approved by Owner.

E. Water heating equipment shall meet latest ASHRAE standard A90.1 Table 7.8.

F. Water heating equipment shall not be subjected to system pressures beyond its ASME stamped working pressure.

G. Provide NSF and ASME compliant pre-pressurized steel thermal expansion tank with membrane on the cold water supply line of all water heating equipment where cold water service contains check valves, pressure reducing valves or backflow preventers. Thermal expansion tanks shall be sized in accordance with manufacturer's published recommendations.

2.05 CONTAMINATION PREVENTION

A. Design of domestic water systems shall avoid all cross connections and eliminate the possibility of water contamination. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide an approved vacuum breaker or backflow preventer. Location of vacuum breakers shall prevent any possible backflow through them.

B. Backflow preventers shall be duplexed where located within lines serving in-patient areas, critical research areas, and any area or equipment where un-interruptible (24 hour) water service is required. Coordinate with Owner to determine areas and equipment that require uninterruptible service.

C. Avoid providing individual backflow preventers for each piece of equipment where domestic water serves centralized multiple equipment such as sterilization equipment, fume hoods, etc. Cold and hot water shall be provided by dedicated services separated from the domestic water distribution system by duplexed reduced pressure backflow preventers. All piping downstream of the backflow preventers shall be identified as non-potable water.

D. Backflow preventer test ports shall not be located more than 60 inches above finished floor or permanent platform.

E. Pipe relief from backflow preventer indirectly to drain of sufficient size to evacuate maximum flow discharge.

F. Vacuum breakers for hose connections in health care or laboratory areas shall not be less than 72 inches above the floor with the following exceptions:

1. Vacuum breakers integral with faucets or equipment;

2. Vacuum breakers for bedpan washer hoses shall not be located less than 60 inches above the floor.

G. Do not install vacuum breakers above ceilings, above equipment, concealed within walls or any location where water leakage can cause damage.

H. Vacuum breakers (including vacuum breakers that are integral with faucets) shall not be installed under exhaust hoods or similar locations that may contain toxic fumes or vapors.

I. Shock absorbers (water hammer arrestors) shall be located as close as possible to the piping served. Pipe extensions shall not be used to connect shock absorbers to piping.

J. Where permanently disconnecting domestic water supplies serving fixtures or equipment, remove all associated piping back to active main to avoid stagnation.

2.06 PURIFIED WATER

A. Install water-proof curb and floor coating in room where water purification system is located.

B. Install a floor drain in room where water purification system is located.

C. Water purification system manufacturer shall have an established service team in the Houston region.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All piping and valves shall be located and sized on Contract Drawings.

B. Indicate location and size of all valve access panels on floor plans.

C. Include a domestic water system distribution schematic indicating information required to clearly illustrate the intent of system design including, but not limited to, supply source, booster pumps, water tanks, hot water heaters, hot water return pumps, piping mains, risers, pressure regulating stations, backflow prevention, main and riser shut-off valves. Calculated flow rates used for system design shall be noted at supply entrance, pumping system

discharge, base of risers, hot water return circuit setters/balancing valves and sectional floor valves at risers. Branch piping to fixtures and equipment is not required to be shown on domestic water system distribution schematic provided that it is included within sanitary waste and vent system riser diagrams or individual equipment details.

D. Include details on the Contract Drawings to clearly identify installation requirements for all domestic water system components included within the Project, including but not limited to; water storage tanks, water heaters, pressure regulating stations, building water service riser, pumps, master thermostatic mixing valve assemblies, backflow preventers, trap primer units, roof penetrations, floor and wall penetrations.

E. Include schedules on the Contract Drawings to clearly identify capacity, size, model, options and other requirements for all domestic water system equipment included within the Project, including but not limited to; booster pumps, hot water return pumps, water heaters, thermal expansion tanks, pressure regulating valves, master thermostatic mixing valve assemblies, water hammer arrestors, backflow preventers, hot water return circuit setters/balancing valves.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser

END OF ELEMENT D2020