DESIGN GUIDELINE 220010
PLUMBING SPECIALTIES

Scope

Water hammer arrestors, domestic and fire protection back flow preventers, pressure reducing stations, city water meters, domestic hot water mixing valves (hand washing), floor drains, trap primers, emergency eye washes and showers, along with mixing valves, small RO systems to improve drinking water, and garbage disposals .

Related Sections

U-M Design Guideline Sections:

U-M Master Specification Sections:
MS211313 - Wet and Dry Pipe Sprinkler Systems
MS221119 - Domestic Water Piping Specialties
MS221319 - Drainage Specialties
MS224200 - Plumbing Fixtures

U-M Standard Details:
MD 2211313 001 - Fire Service System Detail
MD 221119 001- Domestic Water Service System Detail

Reference Documents:

Design and Installation Requirements

ANSI Z358.1-2009 Emergency Eyewash and Drench Showers

General Material Requirements

UM Master Specification shall be used as the specification on all projects, edit to make it project specific. Turn on hidden text and read all the spec editors notes when editing the specification.

Water Hammer Arrestor

Install ball valves for isolating water hammer arrestors for service.

Backflow Prevention

Utilize the U-M details indicated above. These details are intended to reflect both City of Ann Arbor and U-M requirements, but shall be revised as required to make project specific (e.g. to

reflect parallel backflow preventers for those projects using such an arrangement). For reduced pressure zone type back flow preventers, indicate where the preventer drain is to be routed to.

Type of Back Flow Prevention Device Required:

The type of backflow prevention device *at the building entrance* must be approved by the City of Ann Arbor and/or the Authority Having Jurisdiction (AHJ) The following reflects what is acceptable to the City, projects should therefore initially propose (with explanation) the following backflow prevention devices for City approval. *In all cases, correspondence with the City shall be made through the U-M Design Manager.*

Domestic Water at all New Building Entrance and major renovations of existing buildings (including hospital, medical building and high chemical hazard building):

Buildings without pressure booster pumps and a single feed from the water main: A testable UL and AHJ approved double check valve assembly is required by U-M. Protect individual backflow hazards within the building with the type of backflow prevention device required by code, located at the hazard.

Buildings with two or more feeds from the water main, or with pressure booster pumps: Testable UL and AHJ approved double check valve assembly is required by the city of Ann Arbor and UM on each feed from the water main. Protect individual backflow hazards within the building with the type of backflow prevention device required by code, located at the hazard.

For buildings with (2) fully redundant water services (ie inpatient hospitals), a single BFP assembly on each service, sized for 100% design flow, is required. For critical buildings with a single water service where the interruption of water service would pose safety issues or not meet regulatory compliance (ie ambulatory surgery centers, other campus building types) provide (2) BFP assemblies piped in parallel, each sized for 100% of the design flow. This arrangement allows one BFP to be repaired while maintaining full water service to the facility. For non-critical facilities (ie business use), provide (2) BFP assemblies piped in parallel, each sized for 50% of the design flow. This arrangement allows one BFP to be repaired while maintaining partial water service to the facility.

Backflow preventer bypasses are NOT permitted.

The city of Ann Arbor approved devices can be found on the ASSE Product Certification Search website https://forms.iapmo.org/asse/listed/.

Fire Service At Building Entrance, All Building Types:

A testable UL City and AHJ approved double detector check valve assembly approved for fire service is acceptable. Protect individual backflow hazards within the building, a small dry pipe zone chemically protected against microbiologically induced corrosion (MIC), with an RPZ BFP device located at the hazard. For buildings where extensive portions of the fire protection system are chemically treated to avoid MIC or for other purposes, provide a RPZ BFP device at the building entrance. Normally provide two RPZ assemblies each sized for 50% of the total

required flow rate, piped in parallel, to allow one RPZ to be repaired while the other remains in service.

Back Flow Prevention and City Water Meters Located in Vaults:

Contact City of Ann Arbor and/or AHJ through the U-M Design Manager for specific requirements regarding vault construction.

Individual Hazards Within Buildings:

Install backflow preventers within building as required to isolate hazards from distribution piping. Typical locations are make-up to chilled and heating water systems and cooling towers, and equipment connections, such as lab and vivarium equipment. When cost effective, aggregate such connections onto a non-potable water circuit to reduce the number of BFP assemblies, in particular RPZ type. When RPZ type BFPs protect systems that produce rapid pressure fluctuations downstream of the RPZ, provided a soft seated non-slam check valve immediately downstream of the RPZ. This prevents spitting out of the RPZ drain port. Examples are systems with fast closing valves or rapidly cycling pumps (RO generation).

Pressure Reducing Valve (PRV) Stations

The A/E should separate the potable water distribution risers in high-rise buildings with only the upper floors served by booster pumps to preclude the need to add PRVs to the lower floor piping. Provide parallel PRV's, each sized for at least 50% design flow. When a single PRV is being provided, it makes maintenance very disruptive as it impacts the entire floor.

The PRV shall be sized for 25 percent reserve capacity at a 250 psi working pressure.

As appropriate, PRVs should be equipped with a smaller auxiliary regulator to handle low demands. The valve should include a full compliment of gauges and accessories.

Cold Water PRV set points shall be coordinated with hot water system pressure and/or hot water PRV set points, in particular when using the Campus hot water system, to prevent significant pressure imbalance between the two systems.

City Water Meters

Each building shall contain a water meter.

Provide calculations demonstrating the expected range of city water flow rate at the building entrance, for City of Ann Arbor review. For new buildings as well as major renovations in existing buildings, the size of the meter will be negotiated with the City. The City may request that existing meters be replaced. *In all cases, correspondence with the City shall be made through the U-M Design Manager.*

A separate city water meter is required for the following:

- Domestic water (building entrance)

- Cooling tower make up water
  (deduct meter for water assumed evaporated)
- Cooling tower blow down
  (deduct meter for removal of sewer cost)
- Irrigation system
- Other significant uses which do not ultimately discharge to the city sewer

Route cooling tower overflow drains through the cooling tower blow-down meter.

As indicated on U-M's Fire Service System Detail, for fire service to a building, the City will provide a FM and/or UL approved bypass meter for the testable double detector check valve assembly.

Coordinate meter installation with the University Design Manager. The meters shall be purchased by the University (include cost in project budget) from the City of Ann Arbor. Installation shall be performed by the contractor.

City magnetic flow meters require 120VAC power with a lockable disconnect located at the meter.

City meters require a remote read-out device (a small, wall mounted box) hard-wired to the City meter. This allows the City to read the meter remotely with wireless technology. The City system has good range and typically can read the device even when mounted on a high building roof. The remote read-out device must be mounted above grade and normally should be located on an outside building wall. However, the device usually works when mounted inside the building on an outside wall, which may be preferable when the distance between the meter and an accessible outside wall location is excessively long. Devices that don't work will require relocation. Meters located outside (e.g. on a roof near a cooling tower) can have the read-out device mounted at a convenient, appropriate location near the meter. In all cases the device must be mounted at a location accessible (no ladders required) to a City meter technician; inside locations should typically be mechanical rooms.

Domestic Hot Water

When the domestic hot water is provided from the Central Power Plant / tunnel system, provide a meter and a check valve on the incoming water line. Note: this is not a meter billed by the city of Ann Arbor or maintained by the University Utilitites Department. This meter is used for monitoring and managing hot water consumption on a building level for energy conservation and sustainability.

Thermostatic Mixing Valves for Hand Washing Facilities

The Michigan Plumbing Code section 607.1 (2) (h) has been modified by local rule as follows:

> An ASSE 1070 mixing valve (water temperature limiting device) is permitted to control up to 5 accessible plumbing fixtures within the same room. The ASSE 1070 mixing valve shall be certified for a minimum flow rate of 0.5 gpm or less.

Therefore accessible plumbing fixtures at U-M do not require dedicated mixing valves for the conditions stated above. This modification is incorporated into the U-M Plumbing Fixture Specification MS224200.

Floor Drains

Generally, floor drains shall not be installed in laboratory areas or below emergency showers. Consult with the U-M Design Manager and building users for possible exceptions. Consider need for installing floor drains at high traffic building entrances (e.g. below walk-off mats).

Trap Seal

When trap primers are not provided, the design shall include a trap seal for each of the floor drains. However trap seals are NOT permtted in high hazard circumstances.

Trap Primers

Trap primers are not required at the University of Michigan, regardless of Michigan Plumbing Code dictates, except for high hazard circumstances, (eg., BSL3 and BSL4 labs), and applications where a dried trap might pose an undetected IAQ problem, (eg., floor drains located inside air handling units), or where it is difficult to re-prime a trap, e.g. below walk-off mats. Therefore trap primers should not be specified for toilet room, mechanical room, safety shower, and similar low hazard floor drains. The Designer shall identify high hazard or other circumstances as mentioned above and include trap primers for such drains. For drains requiring trap primers, the use of multi-trap primers, including electrically operated types, is permitted. Multi-trap primers should conform to ASSE 1018 or ASSE 1044, but do not have to be specifically listed as conforming to those standards, provided their design incorporates an ASSE approved back flow prevention device.

Emergency Eyewashes and Showers

Freestanding eyewashes shall be designed to drench both eyes simultaneously and have a waste line connected to the building sanitary waste system.

In accordance with ANSI Z358.1-2009 water supplies to eye washes and showers shall be "tepid". Tepid water is defined as "a flushing fluid temperature conducive to promoting a minimum 15 minute irrigation period. A suitable range is 60-100F".

EMERGENCY FIXTURE APPLICATION SCHEDULE

NOTE: All fixtures & fixture types MUST be verified for each application with UM Environment, Health & Safety - EHS during design.

Area	Emergency Fixture Type EW=Eyewash/ EEWS-A,B,C, D, E, F DH = Drench Hose/ EEWS-G SH= Shower/ EEWS-H, I, J	Notes
Battery room	DH	Emergency fixture not required for mainentance-free battteries
Biomed	DH	
Boiler chemistry test room	EW, DH, SH	
Boiler room	EW, DH, SH	
Dialysis unit	EW, DH	
Generator room	DH	Emergency fixture not required for maintenance-free batteries.
Haz mat storage area/RCRA room	EW, DH, SH	
HVAC water chemical treatment (cooling tower & closed loop)	DH	
Instrument Processing	DH	Manual processing only. Emergency fixture not required for automated processing.
Janitor's Closet	DH	Required on all floors due to environmental services cleaning chemicals.
Kitchen	EW, DH	At location where cleaning chemicals are dispensed.
Laser Lab	EW, DH	Confirm if needed with EHS. Based on chemical used (if fume hood is present)

Loading dock	DH	Review use of hazardous chemical received/shipped or use of battery-powered forklift
Maintenance Shop	DH	
Oncology Infusion	DH	
OR Scrub	DH	Drench hose mounted on scrub sink.
Pathology (Incl. Blood Gas Lab) (does not include blooddraw sites or POC lab)	EW, DH	Drench hose required for formalin cubes (20L container) If DH shower not needed
Pesticide/ Herbicide Storage & Mixing	EW, DH, SH	
Pharmacy - Compounding	EW, DH	Mounted on backsplash of handwashing sink, immediately outside of drug compunding area.
Pharmacy - Retail		None needed (cannot have fixed plumbing in this area). No hazardous chemicals allowed.
Pool/Hydrotherapy/Fountain Pump Room	DH	
SPD - CLEAN side	EW, DH	
SPD - DECON side	EW, DH	
Warehouse storage	EW, DH	Required when storing hazardous chemicals
Wet Lab	EW, DH, SH	

Notes:

1) Emergency fixtures mounted to discharge over sinks shall only be mounted in sinks intended for clean use (ie handwashing) and not mounted in sinks for dirty functions. AE shall coordinate sink bowl dimensions with emergency fixture data on plume stream, to prevent splashing. All spray should be contained within bowl.
2) Fixture(s) may be individual or combination type.
3) It shall be up to the user/situation/project to determine and apply a specific type or combination of types of emergency fixtures.

4) Eyewash/ Shower fixture shall be accessible per ANSI Z358.1 standards which dictate less than 10 sec travel time and max 55 ft of travel, not behind a door and within clear view. A closeable door is considered an obstruction in the path of travel and is not allowed. Provide 36" clearance around fixture, min 48" clear above. Flushing fluid pattern must between 33"-53" from the surface on which the user stands (max 17" from counter edge for 36" high counter) and 6" minimum from the nearest wall or obstruction (faucet, shelf, etc).
5) All emergency fixtures should be provided with a discharge to drain. Consult project manager when fixture location prevents drainage.
6) All emergency fixtures should be hard piped to water & sewer. Portable fixtures should only be used with special approval from EHS.
7) Emergency eyewash fixtures and eyewash drench hose fixtures can be used interchangeably to meet the code requirement for an emergency eye wash. Emergency eyewash drench hoses provide advantages over eyewash fixtures in their flexibility of operation and limited footprint. This application schedule is meant to reflect the preference of eyewash drench hoses for certain applications.

Emergency Fixture Thumbnail Pictures (For Reference Only)

EEWS-A

EEWS-B

EEWS-C

EEWS-D

EEWS-E

EEWS- F

EEWS- G

EEWS-H

EEWS-I

EEWS-J

Small RO Systems to Improve Drinking Water

Small RO systems (often located below sinks) used to improve the quality of water for drinking, coffee brewers, etc., are to be avoided due to water waste during operation and on-going maintenance, back-flow and sanitation issues.

Garbage Disposal

Do not install garbage disposal on sinks associated with office kitchettes, residential kitchen and other sinks not associated with commercial food production. Rather it is recommended that food waste be disposed of in compost bins.

Rationale:

- Garbage disposals in kitchenettes and residential kitchens increase the likelihood that sinks will be used to dispose of food waste.
    - This food waste contributes to excessive fat, oils and grease (FOG) in the sanitary waste stream, a contentious issue with the City of Ann Arbor.
    - This food waste also contributes to pipe blockage, both within the buildings, and in sewers, causing significant operational expense for U-M and for sewer authorities.
    - In many locations, some of this food waste could be composted.
    - Disposing of waste through the sewer is inefficient, using considerably more energy (including transportation costs, filtration at treatment plants etc.) than just removing through the trash, or better yet, through composting collection.
- It costs more to install, repair and replace sinks with garbage disposals, than without them.
- Less material is required without disposals, reducing the overall carbon footprint.