



Directive: 22-1 Plumbing

Responsible Office: Design & Construction

Last Revised Date: July 2023

SUMMARY

This Directive provides the consultants with the requirements of the State University Construction Fund for SUNY projects. The requirements detailed within are to be implemented into the project's specifications and/or drawings. The intent is not for the specifications or drawings to reference back to this document for compliance nor is it intended to override or amend the local or state codes where either is more stringent.

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Section 1 - DEFINITIONS

- Accessible: Location which can be reached and adjusted reset or maintained by hand.

Section 2 - CODE AND REFERENCE STANDARDS

1. Refer to Directives of section 1A for required submittal requirements. In addition, provide specific plumbing requirements of the following directives:
 - a. 1A-4 "Schematic Design Phase."
 - b. 1A-5 "Design Manual Phase."
2. Refer to Directive 2-3 "Site Utilities"
3. Refer to Directive 7-2 "Roofing and Re-Roofing"
4. Refer to Directive 21-1 "Fire Protection"
5. Refer to Directive 22-2 "Fuel Gas/Liquids"
6. Codes, Standards, Regulations and Guidelines:
 - a. Building Code of NYS
 - b. Plumbing Code of NYS
 - c. National Fire Protection Association (NFPA) Standards
 - d. New York State Department of Health (NYSDOH) Regulations, including cross connection control
 - e. Facility Guidelines Institute (FGI) Guidelines
 - f. Local Codes and Water supplier regulations

Section 3 - GENERAL REQUIREMENTS/REGULATIONS

A. Renovations

1. Where permanently disconnecting piping from fixtures or equipment, remove all piping back to active mains and cap at that point to avoid stagnation.
2. Where existing piping is being considered for reuse, assess the condition and capability of the piping prior to Design Manual submission of the project. The assessment may require physical inspection and/or testing to be performed such as removal of portions of the piping, camera inspections or ultrasonic testing.
3. For laboratory type spaces, provide manual shut off for all services to each laboratory. Location of valve inside or outside of laboratory is to be coordinated with the Campus.

B. Routing

1. Do not locate piping above sensitive equipment or areas such as electrical rooms, electrical closets, telecommunication rooms, IT rooms, elevator machine rooms, etc. where water leakage would cause significant property loss, contamination, or disruption to building utility systems.
 - a. If there is no other option to relocate the piping it must be installed in a double wall containment system.
2. Condensate piping from HVAC cooling coils is to be provided with cleanouts. Cleanouts are to be located at the first horizontal elbow from the unit, and at every 90 degree or more change of horizontal flow direction.

- a. Auxiliary drainage is to be provided in areas of the building where possible water damage to any building component can occur, and where no means of water level monitoring exist.
 - 1) Drain pans shall be stainless steel, pitched to drain, and externally insulated.
- b. Condensate piping from floor equipment such as air handling units is to be routed as to prevent tripping hazards and not to obstruct maintenance, travel path for other equipment, or path of egress.
- c. Condensate piping is to terminate inside the building.

C. Equipment

1. All reciprocating and rotating equipment shall be vibration isolated.

Section 4 - FIXTURES, FAUCETS AND FIXTURE FITTINGS

A. General Requirements

1. The Consultant must comply with Campus standards. See Directive 1C-10 Coordination with Individual Campus Standards.
2. Fixtures, Faucets and similar are to be located such that piping will not be installed in exterior wall.

B. Urinals and water closets

1. Do not specify waterless urinals unless requested by the campus.
2. Confirm with the Campus whether dual flush water closets, and manual, AC electric powered, or battery powered electronic sensor flush valves and sink faucets should be provided.
3. Confirm with the Campus whether floor mounted or wall mounted water closets should be provided. Wall mounted water closets shall be supported by carriers bolted to the floor. Fixture weight shall not be transmitted to walls or partitions.

C. Dishwashing Machines

1. Provide dishwashing equipment with electric booster heater to produce the necessary water temperature.

D. Drinking Fountains

1. Unless otherwise preferred by the Campus or required by Code, hands free automatic water dispensers designed to fill personal bottles shall be installed as 50% of the required number of drinking fountains.
2. The Consultant will coordinate the selection of water fountains and water dispensers with Campus and incorporate Campus preferences into the design.

E. Emergency Eyewash/Shower stations

1. Provide an emergency eyewash/shower station(s) in spaces which users can be exposed to injurious corrosive materials in conformance with ANSI/OSHA recommendations and where the Campus EHS officer requires them. Confirm with the Campus if floor drains, monitoring, etc. are to be provided for emergency eyewash/shower stations.

2. Emergency eyewash stations are not to be integral to the faucet for service/mop sinks.

F. Floor Drains

1. Required sloping of the floor in locations with floor drains is to be coordinated with the structural engineer.
2. Equipment rooms are to be furnished with drains near all major equipment that must be periodically drained. Funnel drains may be required for splash control.
3. On each floor, provide at least one floor receptor located in a janitor's closet.

Section 5 - WATER HEATERS

A. General Requirements:

1. When utilizing steam, high temperature hot water, or medium temperature hot water provide a packaged manufactured water heater including controls and control valve provided by the water heater manufacturer.
2. When utilizing natural gas, provide high efficiency condensing water heater. Refer to Fuel Gas Directive for natural gas piping requirements.¹
3. Heat pumps are to be evaluated for domestic water heating capability and used where site conditions allow, and climate is favorable to produce required heating water.
 - a. Supplemental electric heating can be used where heat pump alone cannot obtain 140DegF.

Section 6 - WATER SUPPLY AND DISTRIBUTION

A. General Requirements

1. Comply with requirements of municipal water utility or Campus standards for metering. Include provision for connection of remote monitoring and recording usage and include unions/flanges and valves to allow for meter replacement.
2. Each building should be provided with metering for water usage and incorporated to the energy management system.
3. Confirm with the Campus the need for domestic water conditioning (filtration, softening or other quality adjustments).

B. Water Distribution

1. Domestic water service piping shall be connected directly to the campus distribution or municipal water system independent of the fire protection service. If the campus desires to combine into a single service, or if it is not feasible to provide separate services then the fire protection service and the domestic service must split prior to entering the building and upstream of the post indicating alarm valve.
2. Domestic cold-water distribution system is to be provided with a booster pump at the main building entrance when the municipal water pressure is not sufficient for the height and/or

¹ Natural Gas water heaters are only allowed for emergency backup, or for process loads. Project scope must comply with CLCPA. (Reference - Directive 1B-2)

layout of the building to meet the minimum pressure requirements for connected systems or fixtures.

- a. Connect domestic water booster pumps and sump pumps to standby power in accordance with Campus preferences.
3. System water temperatures
 - a. Cold Water² < 77°F
 - b. Hot Water Generation ≥ 140°F
 - c. Hot Water Distribution ≥ 125°F
 - d. Handwashing lavatories ≤ 110°F
 - e. Healthcare applications follow all NYSDOH and FGI guidelines
4. Domestic hot water recirculation:
 - a. For clinical installations provide a hot water recirculation system that provides hot water at each point of use which meets an agreed to “time to temperature” performance. Confirm with local Department of Health and Campus the time to temperature requirement. For the initial balancing flow setup, the “time to temperature” is to be measured at the last fixture of the branch (furthest away from main line/riser).
 - b. Each branch of hot water recirculation piping is to be provided with automatic balancing valves downstream of last fixture of the branch. Automatic Balancing valves are to be in an accessible location and provided with pressure gages up and downstream of the balancing valves.
 - c. High Rise Buildings
 - 1) High rise buildings as defined by the BCNYS are to have separate hot water recirculation systems serving a maximum of 4 floors separated by a PRV and a plate and frame heat exchanger to maintain hot water re-circ loop.
 - 2) Configuration of the system should eliminate the necessity of PRV unless absolutely necessary.
 - d. Drawings/Specifications are to depict the maximum allowable pipe length/volume from the heating source as per the table below.

² Cold water piping is to be distributed such that the water is maintained below the listed temperature to prevent legionella growth. Piping is not to be routed through steam vaults, boiler rooms or rooms where rise in temperature might occur due to ambient conditions.

PIPING VOLUME AND MAXIMUM PIPING LENGTHS

| NOMINAL PIPE SIZE (inches) | VOLUME (liquid ounces per foot length) | MAXIMUM PIPING LENGTH | |
|----------------------------|--|-------------------------|-------------------------------|
| | | Public lavatory faucets | Other fixtures and appliances |
| 1/4 | 0.33 | 6 | 50 |
| 5/16 | 0.5 | 4 | 50 |
| 3/8 | 0.75 | 3 | 50 |
| 1/2 | 1.5 | 2 | 43 |
| 5/8 | 2 | 1 | 32 |
| 3/4 | 3 | 0.5 | 21 |
| 7/8 | 4 | 0.5 | 16 |
| 1 | 5 | 0.5 | 13 |
| 1 1/4 | 8 | 0.5 | 8 |
| 1 1/2 | 11 | 0.5 | 6 |
| 2 or larger | 18 | 0.5 | 4 |

5. For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 liquid ounce = 0.030 L, 1 gallon = 128 ounces.

C. High Purity Water systems (RO) (RO/DI)

1. The type of pure water required for a project shall be determined during meetings with the Campus and building users. Pure water systems shall be specified and detailed on the drawings and shall indicate the following criteria. Point of use systems are a Campus elected option and may be preferred.
 - a. Project water quality requirements: Resistivity (Meg Ohms cm), Total Organic Carbon (TOC) (ppb), Particulates > 0.2µm (units/mL), Silica (ppb), and Bacteria (cfu/mL)
 - b. Pure water production rate (gallons/day)
 - c. Storage tank volume
 - d. Distribution loop flow: Design velocity (feet/sec), Design flow (gpm), and pump head (ft. or psi)
 - e. City (well) feed water analysis
2. Pure water systems suppliers shall provide testing and a certified report indicating that the equipment is performing as designed. Water samples shall be taken at the pure water system in the mechanical room.

D. Valves

1. Pressure Reducing Valves
 - a. Where water pressure exceeds maximum allowable pressure for the fixtures, a pressure reducing valve should be provided to control each zone of fixtures vs providing a single pressure reducing valve at each fixture.
2. General Valves
 - a. Use butterfly and full port ball valves in lieu of gate valves.

- b. All valves shall be accessible for operation and servicing. Provide access panels for all concealed valves.
 - c. Provide line size shut-off valves at locations required for proper operation, servicing, and troubleshooting of domestic water distribution systems and connected components. Locations shall include but not be limited to the following:
 - 1) At each fixture and piece of equipment.
 - 2) At each branch take-off from mains.
 - 3) At the base of each riser.
 - 4) At each battery of fixtures.
 - 5) At strategic locations to provide sectional isolation of distribution without disrupting services to larger portions of the system.
3. Thermo Mixing Valves
- a. Provide an ASSE certified mixing valve listed specifically for the type of fixture or group of fixtures with the sufficient turndown (equal to the lowest connected fixture flow rate) to limit the hot water to maximum temperature as per the prescribed levels of the NYS codes. Fixtures requiring thermo mixing valve include but are not limited to public handwashing facilities, showers, and emergency fixtures.
4. Hose Bibbs
- a. Confirm with the Campus the need for a hose bibb (24" – 30" above finished floor) and a floor drain in each mechanical room.
 - b. Confirm with the Campus the need for and location of hose bibbs in restrooms.
 - c. Confirm with the Campus the locations and spacing of freeze proof wall hydrants on building exterior.
- E. Backflow prevention
1. General Installation
 - a. Backflow prevention between the Campus and the municipal water supply shall be provided at each point of service/connection.
 - 1) When backflow prevention is added to a municipal water system, an application must be made to the municipal water service provider for their review and approval. This application process should be initiated during the project's Schematic design phase so that the specific requirements of the water supplier can be addressed.
 - (a) The Campus shall be included in the application process and may elect to make the application on their own behalf.
 - 2) If backflow prevention between the Campus and the municipal water supply exists, backflow prevention is only required downstream for individual buildings identified as potential contamination sources, such as laboratories, utility buildings, repair garages or art studios. Determination whether a building is a potential contamination source shall be determined by consultation with the Campus and the Fund.

- b. Where individual building backflow prevention is required, provide two RPZ backflow preventers, at 50% capacity each, on domestic water system supply to permit testing and maintenance to be performed without interrupting water service to the building.
 - c. All backflow prevention assemblies are to be located indoors in spaces maintained to a minimum of 55°F.
 - 1) Only if indoor backflow prevention is not possible, outdoor aboveground installation is to be approved the FUND and the Campus. Provide a heated enclosure, and a maintenance electrical outlet and lighting within or near enclosure.
 - d. Provide individual RPZs on all hazardous intra-building connections such as HVAC equipment, boilers, irrigation systems, cooling towers and kitchen/food service equipment.
 - 1) Locate isolation valve and solenoid valve if provided, for cooling tower make-up water line inside the building. Slope make-up water line to allow for full drainage. Provide additional hose bib connections with ball valves and caps as needed for full drainage when the low point does not occur at the basin of the cooling tower.
 - e. For hospitals and health care facilities the backflow preventors are to be selected per the approved list of NYSDOH, and as referenced to <https://fccchr.usc.edu/list.html>
2. Drainage
- a. Drainage for backflow prevention assemblies shall be provided for all installations to accommodate water discharge during testing or operational discharges. Uncontrolled water discharge from assemblies is prohibited. Provide gravity drainage to the sewer system, sized for the maximum expected flow from the assembly. Drainage piping is to be routed as to not cause a nuisance or a tripping hazard. Discharge is to be designed for catastrophic failure under actual operating conditions.
 - b. Where gravity drainage is not possible, an alternative method of holding and pumping the water to the sewer system shall be discussed with the Campus and the Fund prior to implementation in the design documents.
 - 1) Where an alternate method for draining is utilized, provide an automatic shutoff valve upstream of backflow prevention assembly to automatically shut off the water supply in the event of the operation of any backflow prevention assembly. This event shall initiate an alarm to the BMS.
3. Testing Requirements
- a. Specifications are to call for the backflow prevention device to be tested by a certified backflow prevention device tester.
4. Retrofit Projects
- a. For projects which include retroactively adding backflow prevention, it is required that an engineering study be performed to assess the impact of any water pressure reduction due to adding the devices.
 - 1) For sprinkler systems, analyses and calculations as required by NFPA 13 shall be performed to determine what, if any, system modifications are required to maintain proper system operation.

- 2) For domestic water systems, an assessment of the impact of backflow prevention on flush valve operation and other pressure dependent devices shall be performed to determine what, if any, modifications are required to maintain proper operation.
 - (a) Submit catalog cuts of proposed backflow devices and calculations.

Section 7 - SANITARY DRAINAGE

A. General Requirements

1. Confirm with the Campus the need for and location of a floor drain in restrooms.

B. Routing

1. The building sanitary system is expected to flow by gravity to the exterior sanitary sewer. Sanitary drains that cannot be discharged by gravity shall be routed to a sump and be pumped out to a point in the sanitary sewer capable of flowing by gravity. Provide duplex, lead-lag pumps with local audible and building management system high water alarms. Confirm with the Campus if pumps are to be connected to standby power.
 - a. When locating sumps, proximity to an opening in the building exterior should be considered to allow for pumping out or cleaning of sumps by equipment outside the building.
2. Coordinate invert elevations with civil engineer for all drainage piping leaving the building. Invert elevation is to be called out on the plumbing and civil drawings at the point where the piping leaves the building, or where the continuation is called out the other discipline.
3. Where two consecutive 45 degree elbows are used in order to provide a 90 degree change in direction of flow in horizontal drainage pipe, a condensate drain, or a building sewer, a cleanout shall be installed at the elbow.

C. Existing Piping

1. In building rehab projects, during the design phase, the sanitary drain piping below grade needs to be visually inspected and verified operational with proper sloping, and no obstructions.

Section 8 - INDIRECT/SPECIAL WASTE

A. General Requirements

1. Receptors are to be used for dumping water from the floor cleaning machines. Verify equipment requirements with the campus. A watertight curb approximately 8" high should be provided.

B. Routing

1. As much as possible route indirect drainage to sinks in janitor's closets or other suitable fixtures instead of providing indirect drains with trap seals or primers on storm or sanitary lines.
2. Determine where the campus will install chemical dispenser systems for janitor closets, kitchens, or any other locations. To prevent direct connection of a chemical dispensing system to the service/mop sink faucet provide a separate capped cold and hot water supply

with valves to the space in a location as directed by the campus. Lines are to be used for future connection by the campus to the chemical dispenser, emergency eyewash and/or shower.

3. Where indirect drain connections (hub drains) cannot be avoided, they must be accessible. Do not conceal indirect drains in walls or other construction. Waste receptors shall not be installed in plenums, crawl spaces, attics, interstitial spaces above ceilings and below floors.
4. Indirect drains are to be sized for the full flow from the sump pump, PRV, or other sources which are routed to the indirect drain. Indirect drains are not to overflow or flood due to discharge.

C. Cooling Towers, Evaporative Condensers or Fluid Coolers

1. Water cooling towers, evaporative condensers or fluid coolers shall have their drains, overflows, and blowdown piping indirectly connected to the buildings sanitary drainage system. Indirect connections to the sanitary within the building shall be in a room that also has a floor drain installed. Using the storm drainage system and/or roof drain system shall be prohibited.

D. Laboratory Waste

1. Laboratory waste piping and approved dilution or neutralization system(s) shall be provided for all plumbing fixtures where corrosive waste, spent acids, or other harmful chemicals are discharged to the sanitary sewer. Point of use disposal/collection programs are a Campus elected option.
 - a. Exception: Laboratory waste piping and neutralization system(s) may be omitted where all of the following occur:
 - 1) The Campus expresses this preference in writing.
 - 2) The local sewer authority agrees.
 - 3) The Campus has protocols for user control of laboratory waste at each source.
 - 4) Valved sampling port is provided for future testing of the discharge.
 - b. If plastic piping materials are intended to be used, an analysis of the expected chemicals to be encountered shall be performed and used to select suitable piping material.

Section 9 - VENTS - RESERVED

Section 10 - TRAPS, INTERCEPTORS AND SEPARATORS

- A. Barrier-type trap seals are recommended in lieu of trap primers for floor drains, indirect drain connections to storm or sanitary lines.
- B. Locations of grease interceptors and oil separators need to be coordinated with the Campus.
 1. Locations of grease interceptors and oil separators need to be accessible as to allow for pumping and cleaning by a pump truck, unless approved other by the campus.

Section 11 - STORM DRAINAGE

- A. Discharge of secondary storm drain is to be "in a location that would normally be observed by the building occupants or maintenance personnel." Such locations are not to be behind landscaping where it will not be visible, or in locations not accessed on daily bases.

Section 12 – PIPING REQUIREMENTS

A. General

1. Valve and equipment connections shall be made with unions for threaded and soldered piping or flanges for welded piping
2. Where more than one material is indicated for a given application; either or both may be specified at Consultants discretion.
3. Weld-o-lets and thread-o-lets are permitted for steel branch connections 2 or more sizes smaller than the main. Holes for weld-o-lets and thread-o-lets shall be machined (torch cutting not acceptable). Copper branch connections shall be made with tee fittings (mechanically extracted collars not acceptable).
4. Protect piping that passes through or beneath footings or foundation walls per PCNYS.
5. See Directive 2-3 "Site Utilities" for more information on site piping requirements.
6. Hot water, chilled water, domestic cold water and condenser water piping located in mechanical spaces with floor drains or outdoors may be grooved joint.
7. Piping beneath floor slabs shall be installed with no fittings or joints.
8. Plastic piping located in air distribution plenums shall have a Flame spread index < 25 and Smoke developed index < 50 per ASTM E84, as required by the BCNYS.
9. Piping used in medical capacity or hospital - material as outlined in NFPA 99

B. Domestic Cold Water Inside Building

1. All sizes:
 - a. Copper Type L, Drawn, ASTM B88 with soldered joints, copper or copper alloy fittings.
2. 3" or larger:
 - a. Copper Type L, Drawn, ASTM B88 with soldered joints, copper or copper alloy fittings.
 - b. Ductile Iron, Class 52 AWWA C115, AWWA C151 with flanged or mechanical joints, ductile iron fittings.
3. Insulation: Fiberglass with all service jacket and vapor barrier.

C. Domestic Cold Water Beneath Slab

1. 2" or smaller:
 - a. Copper, Type K, Soft Annealed Coils, ASTM B88.
2. 2-1/2" or larger:
 - a. Ductile Iron, Class 52, Cement Lined Asphaltic Coating, AWWA C151, mechanical joint lock with thrust blocks, ductile iron fittings.
 - b. PVC, Schedule 40, Pressure Pipe, ASTM D1785, PVC fittings, Bell and Spigot joints with thrust blocks.

D. Domestic Hot Water Inside Building

1. All sizes:
 - a. Copper Type L, Drawn, ASTM B88, soldered joints, copper or copper alloy fittings.
2. 3" or larger:
 - a. Copper Type L, Drawn, ASTM B88, soldered joints, copper or copper alloy fittings.
 - b. Ductile Iron, Class 52 AWWA C115, AWWA C151, flanged or mechanical joints, ductile iron fittings.
3. Insulation: Fiberglass with all service jacket.

E. Domestic Hot Water Beneath Floor Slab

1. All sizes: Copper Type K, Drawn, ASTM B88, soldered joints, copper or copper alloy fittings.
2. Insulation: Pre-insulated with Polyurethane Foam and HDPE Jacket.

F. Sanitary, Storm, Waste and Vent Inside Building

1. All sizes:
 - a. Copper Type DWV, ASTM B306, soldered joints, copper or copper alloy fittings.
 - b. PVC Schedule 40, Type DWV, ASTM D2665 or D2949, PVC fittings, with solvent welded joints.
 - c. Cast Iron, Asphaltic Coating, Service Weight, ASTM A74, Bell and Spigot or No hub with Heavy-Duty Stainless-Steel Clamp joints, Cast Iron fittings.
2. Insulation Storm Piping Only: Fiberglass with All Service Jacket.

G. Sanitary, Storm, Waste and Vent Beneath Floor Slab

1. All sizes:
 - a. Copper Type DWV, ASTM B306, soldered joints, copper or copper alloy fittings.
 - b. PVC Schedule 40, Type DWV, ASTM D2665 or D2949, PVC fittings, with solvent welded joints.
 - c. Cast Iron, Asphaltic Coating, Service Weight, ASTM A74, Cast Iron Bell and Spigot fittings, Bell and Spigot joints.

H. Cooling Coil Condensate

1. All sizes:
 - a. Copper Type DWV, ASTM B306, soldered joints, Copper or Copper Alloy fittings.
 - b. PVC Schedule 40, Type DWV, ASTM D2665 or D2949, PVC fittings, with solvent welded joints.
2. Insulation:
 - a. Fiberglass with all service jacket and vapor barrier
 - b. Elastomeric

I. Air, Gas and Vacuum Inside Building

1. All sizes: Copper Type L, Drawn, ASTM B88 with Brazed joints, Copper or Copper Alloy fittings.

J. Acid Waste Inside Building

1. All sizes:

- a. Polypropylene, ASTM F1412, Flame Retardant, Polypropylene fittings, Heat Fusion joints.
 - b. Polyvinylidene Fluoride, ASTM F1673, Polyvinylidene Fluoride fittings, Heat Fusion joints.
 - c. Chlorinated Polyvinyl Chloride, ASTM D1784/F2618, Schedule 40, NSF CW-SE Certified with Chlorinated Polyvinyl Chloride fittings, Solvent Welded, ASTM F493 joints.
 - d. Borosilicate Glass, ASTM C1053, Borosilicate Glass fittings, Stainless Steel Compression Coupling joints with TFE Seal.
 - e. Silicon Iron, ASTM A518/A861, Cast Iron fittings, Bell and Spigot joints with Acid Resistant Sealant.
- K. Acid Waste Direct Buried Double Containment
1. All sizes:
 - a. Polypropylene, ASTM F1412, Flame Retardant, Polypropylene fittings, Heat Fusion joints.
 - b. Polyvinylidene Fluoride, ASTM F1673 Polyvinylidene Fluoride fittings, Heat Fusion joints.
- L. Quality Water (RO&DI)
1. All sizes:
 - a. Polypropylene, ASTM D4101, Polypropylene fittings, with electrofusion joints.
 - b. Polyvinylidene Fluoride, ASTM D3222, Polyvinylidene Fluoride fittings, electrofusion joints.
 - c. Stainless Steel pipe and fittings with threaded joints.