
PART 1 - GENERAL

These standards apply to the installation of domestic hot, cold and re-circulation, tempered water, service water, and non-potable water piping and accessories inside building.

1.01 DESIGN CRITERIA

A. Drawings and Specifications:

1. An approved backflow assembly certified by the State of Washington will be provided to protect domestic water systems from contamination.
2. All new piping shall be copper except for above ground combined fire and domestic water piping, which shall be cement lined ductile.
3. Include fixture schedules and fixture locations on drawings for all fixtures including floor drains and trap primers. Include fixture cut sheets in specifications.
4. Include riser diagrams for domestic cold water, domestic hot water, non-potable water, rainwater harvest water, and water re-use piping. Indicate water fixture units and drain fixture units for each pipe section shown on the diagrams.
5. Locate valves and components for easy access and provide separate support where necessary.
6. Indicate invert elevations and point of connection locations.
7. Indicate or specify acceptable slope for all piping.

B. Design:

1. Piping: Main header and main piping distribution system should be sized with 10 to 15-percent extra capacity, maximum water velocity shall be 5 feet per second during peak demand conditions.
2. Service water piping and components (upstream of building pressure reducing valves) shall be suitable for a minimum of 250 psig service.
3. Pressure test piping at 150 percent of maximum operating pressure or at 250 psig minimum, whichever is greater.
4. Water piping and components (downstream of building pressure reducing station) shall be suitable for a minimum of 125 psig service.
5. Provide duplex water pressure reducing station with adequate water pressure

for plumbing fixtures. Use 30 to 35 psig minimum design pressure at furthest (most remote) fixture. Install each pressure reducing valve with an upstream strainer with hose end drain valve, pressure gauges, and isolation valves.

6. Each restroom “bank” shall be designed with “purple” reuse piping sized adequately to provide flushing capacity for the entire bank. Such piping shall extend from the restroom “bank” to the nearest ground level (or near ground level) mechanical room for future connection to the reuse flush water system. Restroom design shall be accomplished so that connection of the reuse flush water shall only route to water closets and urinals. A separate domestic water supply shall be designed to the lavatories, sinks and drinking fountains.
7. Provide full sized discharge pipe from Reduced Pressure Principle Backflow Preventer Assembly(s) or water pressure/temperature relief valves to a suitable location, (use funnel drain with 30” minimum trap and sized three pipe diameter increments larger than discharge pipe, if indoor disposal required).
8. Provide isolation valves to allow shutdown of portions of the system without shut down of the entire system. Each main branch and each restroom shall be provided with isolation valves.
9. Concealed plumbing components shall have access doors indicated on drawings. Minimum access door/panel size shall be 14-inches x 14-inches.
10. Do not use the following:
 - a. Plastic piping (ABS, CPVC, PE, PVC) within the building envelope.
 - b. Dielectric unions (only use dielectric fittings as specified in section 200300).
 - c. Passive or pressure differential activated trap primers.
 - d. Dead-ends on interior building services farther than 10 feet from the fixture. Always include return piping for lavatories complete to each fixture.
11. Design each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/repair of valves and equipment. Design piping vertically and horizontally without diagonal runs in shortest route that does not block access for servicing or replacing equipment, or obstruct usable space. Locate piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. In finished and occupied spaces, conceal piping

from view by locating it in column enclosures, in hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions.

12. Locate groups of pipes parallel to each other, spaced to permit application of full insulation and for servicing valves.
13. Expansion Compensation: Design piping, including mains, branches, risers and run-outs, with sufficient offsets to allow for free expansion and contraction, and sufficient to prevent leaks and over-stressing of piping system. Provide expansion compensators where required when offsets are not adequate for free expansion and contraction, in accessible locations to allow for servicing or replacement.
14. Potable water system (including tempered water and service water) will be cleaned, flushed and sanitized at the completion of any modification.
15. Pipes, fittings, valves, meters, fixtures, solder or flux provided on a potable water system shall be NSF-61 compliant for lead content.
16. Water meters to be installed in a horizontal orientation with face up per manufacture specifications. Meter to be accessible for viewing of top.
17. Domestic water service (both hot and cold) to all buildings and all tenant spaces (no matter what activities occur within the tenant space) shall have a Washington State Department of Health approved reduced pressure principle backflow preventer assembly (RPBA) located in a safely and readily accessible area outside the tenant space to serve as premises isolation to protect the Port's public water system. Properly vented drainage piping (including an approved air gap between the RPBA and the pipe) shall extend from immediately below. The drainage piping shall be sized for the full discharge flow of RPBA service.
18. All backflow devices to be installed such that they are readily-accessible and have clearance above to provide for testing to be completed (typically 18").

PART 2 - PRODUCTS

2.01 PIPING

- A. Domestic Cold Water, Hot Water and Hot Water Re-circulating, Tempered Water, Service Water and Non-Potable Water Piping:

**SECTION 221100 INTERIOR WATER PIPE
AND FITTINGS**

-
1. Service Water Piping: Pipe, fittings, valves and accessories upstream of pressure reducing valves shall be suitable for 250 psig minimum pressure.
 2. Building Water Piping: Pipe, fittings, valves and accessories downstream of pressure reducing valves shall be suitable for 125 psig minimum pressure.
- B. Above Ground Piping and Fittings:
1. Piping Up to 3 inch: Type "L" copper tubing, hard drawn, ASTM B88.
 - a. Fittings: Wrought copper solder fittings and screwed adapters, ANSI B16.22. Cast bronze solder joint fittings and screwed adapters, ANSI B16.18.
 - b. Unions: Wrought copper solder joint unions, ANSI B16.22. Cast Bronze solder joint unions, ANSI B16.18.
 2. Piping larger than 3 inch: Ductile Iron Pipe: AWWA C151. Pipe shall be thin cement lined.
 - a. Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to AWWA C115/A21.15. Flange for set screwed flanges shall be of ductile iron, ASTM A536, Grade 65- 45-12, and conform to the applicable requirements of ASME B16.1, Class 250. Setscrews for set screwed flanges shall be 1310 MPa 190,000 psi tensile strength, heat treated and zinc-coated steel. Gasket and lubricants for set screwed flanges, in accordance with applicable requirements for mechanical-joint gaskets specified in AWWA C111/A21.11. Design of set screwed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.
 3. Flush Reuse Water (non-potable water for flushing that is collected from roofs or other approved sources)
 - a. Type L Copper pipe painted purple every five feet and within every wall cavity or room and displaying the appropriate non-potable piping banding.
- C. Underground Piping Fittings (including Embedded in Concrete - subjected to Mechanical and Plumbing Codes):
1. Pipes up to 3 inch: Piping: Type "K" copper tubing, soft drawn, ASTM B88.
 - a. Fittings: Wrought copper solder joint, ANSI B16.22, cast bronze solder joint, ANSI B16.18.
 - b. Brazing: Silver Brazed Joints.

-
2. Piping larger than 3 inch: Ductile Iron Pipe: AWWA C151. Pipe shall be thin cement lined.
 - a. Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to AWWA C115/A21.15. Flange for set screwed flanges shall be of ductile iron, ASTM A536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250. Setscrews for set screwed flanges shall be 1310 MPa 190,000 psi tensile strength, heat treated and zinc-coated steel. Gasket and lubricants for setscrewed flanges, in accordance with applicable requirements for mechanical-joint gaskets specified in AWWA C111/A21.11. Design of set screwed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.
 - D. Solder: 95-percent tin, 5-percent antimony solder, ASTM B 32. Laco flux not permitted.
 - E. Brazing Alloy: Silver brazed, Melting temperature 1000° F or higher, AWS A5.8. Note: Trap primer piping shall be type “K” from primer to underground trap.

2.02 PRESSURE REDUCING VALVES

- A. Main Building Incoming Water Service - Pilot Operated Pressure Reducing Valves:
 1. Manufacturers: Cla-Val, Armstrong, Hoffman.
 2. Maintains constant downstream pressure with surge protection regardless of varying inlet pressure. Hydraulically operated, diaphragm actuated, globe pattern valve.
 3. Install with upstream strainer with hose end drain valve, pressure gauges, and full-size valved bypass.
- B. Secondary Direct-Acting Pressure Reducing Valves:
 1. Manufacturers: Watts, Fisher, Leslie.
 2. Upstream strainer with hose end drain valve, pressure gages, and full-size valved bypass. Bronze construction with stainless steel strainer screen with isolating ball valves.

2.03 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

- A. Manufacturers: Watts Series 009, Wilkins, Zurn. As approved by Cross Connection Control committee of Washington State.
- B. Backflow preventer shall be equipped with quarter turn ball valves complying with section 200400. Handles for valves shall be positioned for ease of access. Backflow preventer shall be located for ease of access and annual testing. Backflow preventers shall not be located under counters or in cabinet spaces.
- C. Backflow preventer(s) in domestic water service must meet lead free requirements for drinking water system components.
- D. Backflow preventer(s) for tenant spaces outside the tenant lease line, such as in mechanical or meter rooms, must be labeled with space ID and tenant name. If a backflow ID was assigned during design that must be included on label as well.

2.04 ICE MACHINES

- A. Ice Machines must contain an air gap internal to the machine on the water piping. The air gap must comply with NSF Standard 12 for Automatic Ice Making Equipment.
- B. Ice Machines meeting NSF Standard 12 do **NOT** need a backflow preventer as described in section 2.03.
- C. The Operations and Maintenance (O&M) Manual must contain ice machine information. This information will include the documentation and/or certification of the air gap.

2.05 SOAP / CHEMICAL DISPENSERS KITCHEN / MOP SINKS

- A. Automatic Soap or Chemical Dispensers above kitchen and mop sinks must meet air gap requirements as per WAC 246-290-010. A physical separation from the free flowing end of supply and the overflow rim of the receiving vessel, sink or bucket, must be twice the pipe diameter, and in no case less than 1 inch.
 - 1. If necessary, hoses must be trimmed to meet this requirement.
- B. An Automatic Soap or Chemical Dispenser that has an internal air gap that meets the above requirements must be submitted for approval and documented during design.
 - 1. New equipment is being developed for this application. Ecolab is the only current known manufacturer.

2. The Operations and Maintenance (O&M) Manual must contain dispenser information. This information will include the documentation and/or certification of the air gap.

2.06 WATER METERS

- A. Manufacturers: Master Meter, Seametric (MJNR/MJHR), Flows.
- B. Meters shall be equipped with electric pulse output register read in cubic feet output at one pulse per cubic foot. Pulse output will not be accepted through a translator. Meters shall be connected to the DDC system.
- C. Water meters 1 inch size and smaller should be Master Meter Multi Jet or Seametrics MJNR or Flows WM-NLCH (whether for Hot or Cold application). Water meters for Hot Water applications in sizes above 1 inch shall be Seametrics MJHR or Flows WM-NLCH or equivalent in all respects. Water meters for Cold Water applications in sizes above 1 inch shall be Seametrics MJNR or Flows WM-NLCH or equivalent in all respects.
- D. Water meters 2-inches and smaller shall have screwed or flanged ends, bronze case, with electrical output register, to read in cubic feet, for the DDC system and to include (2) each compression couplings. Output in gallons, or an accessory device to convert the output to cubic feet, is not acceptable.
- E. Water meters 2½-inches and larger shall have flanged ends, cast iron case, 175-psi maximum working pressure with electrical output register, to read in cubic feet, for the DDC system and to include (2) each compression couplings. Output in gallons, or an accessory device to convert the output to cubic feet, is not acceptable.
- F. All Water meters must be labeled with water meter Port of Seattle identification number. Water meters for tenant spaces must also be labeled with space ID and tenant name.

PART 3 - EXECUTION

3.01 PIPING SYSTEM CONNECTION PROCEDURE

- A. Press fit pipe joining methods are not allowed.
- B. All new users of the Airport Water System shall:
Notify the POS Water Department of intent, need, date and quantity of water to

be used by updating the Application for Connection – Water System Form throughout the design process. The 90% Application for Connection to Water System will be used for ordering the meter. This must be completed a minimum of four weeks prior to installation requirement.

- C. **Airport Facilities Systems & Utility Shutdown Request** must be completed and submitted for approval a minimum of 10 days prior to flush date. Shutdown request to include planned work with sterilization piping plan for approval. This can be a sketch or marked up plumbing drawings including location of chlorine injection, plan for temporary water connection and protection of alternate main supply and proposed sample locations.
- D. –The piping system must be complete and ready for meter installation before the scheduled installation date. After the meter is installed, the system shall be flushed and sanitized by the Contractor. The POS Water Department will observe the sanitization and flushing procedure and take the sample, which shall be as follows: **(Note all flush and fill water connections must utilize an approved RPBP between the building water system and the “new” system.)**
1. Main Valve (upstream of permanent connection) is to be locked out and secured.
 2. Flush the piping system and perform system pressure testing at 200 psig or 1-1/2 times the working pressure (whichever is greater). System shall maintain pressure for 8 hours without loss of pressure.
 3. Drain the system and charge with water and Chlorine so that the system will achieve a minimum of 50 mg/L chlorine concentration throughout the system. Exercise all valves and movable parts of the system so they all get sanitized.
 4. Let stand a minimum of 24 hours. The residual chlorine system shall have a minimum of 25 Mg/L at the end of the 24-hour period. Drain and flush the system. Dispose of disinfecting water in an approved environmentally safe manner.
 5. Where the tenant may be a concession with many branch piping outlets, the most remote outlet from the water connection will be the primary point of test sampling. All outlets will be flushed, and all outlets will be checked for residual chlorine level after flushing but after residual readings have been satisfactorily taken, only the most remote branch will be subjected to bacteriological sampling.

-
6. When Chlorine levels of 1.5 mg/L or less are obtained, POS Water Department will collect the bacteriological sample(s).
 7. The main valve shall remain locked by POS Water Department until the sample data is analyzed and results are obtained (typically in four business days).
 8. If the sample is acceptable, the main valve shall be unlocked for tenant use.
 9. If the sample fails analysis, a second sample shall be taken and analyzed, and the meter shall remain locked until the sample is approved.
 10. Failure of the second sample will initiate re-chlorination and 24-hour “bake” time followed by flushing, testing etc.

3.02 BACKFLOW DEVICE TESTING REQUIREMENTS

- A. After water sterilization and final water connection(s) are made backflow devices must be tested.
- B. Projects are required to supply a qualified BAT (Backflow Assembly Tester) to test and submit to Port of Seattle water Department (F&I and Maintenance) all Back flow and Cross connection protection device reports before building is occupied. This applies to all new devices and if applicable any devices that were out of service during construction.
- C. Test reports must meet the requirements for Washington State Cross Connection Control. WAC 246-290-490 and WAC 246-292-036.

END OF SECTION