



Section 221100

Facility Water Distribution

DESIGN GUIDE

1 General

1.1 General

- A. CWU has a campus water distribution system that is utilized for fire protection as well as facility water.
- B. Design teams are cautioned that water pressure can be low and that special considerations may be required in design to avoid the need for fire and domestic water booster pumps. This may require oversized pipe, where practical and potential limits on the height of the building.
- C. Where booster and fire pumps are deemed to be necessary, this shall be reviewed with the Mechanical Plumbing Manager (MPM) in the schematic design phase.
- D. At the end of design development, review major pipe routing and branch pipe isolation with the Mechanical Plumbing Manager (MPM).
- E. Show isolation valves for each room and branch piping in the construction documents on the floor plans.
- F. Provide facility backflow prevention in accordance with AWWA. Provide N+1 redundancy on backflow preventors that protect the campus water system from building activities.
- G. All installations shall conform to the Uniform Plumbing Code.
- H. Water piping in this section applies to both potable and non-potable piping.
- I. All piping, fittings, valves, fixtures, faucets and equipment containing or conveying potable water shall comply with the latest US Safe Drinking Water Act mandating any wetted surface of the above-mentioned items



shall not contain above 0.25% lead content by weighted average. All piping, fittings, valve and equipment containing or conveying potable water shall comply with NSF 61 G and NSF 372 or shall be provided with indication on submittals the manufacturer's declaration of self-certification.

1.2 Maintenance Materials

- A. For piping systems that require special tools for installation of joints and fittings, review tooling requirements with CWU Mechanical Piping Manager to determine if CWU has tools for repairs in their stock. If not, specialty tools will be required to be provided with the contract and incorporated in the project documents.

2 Materials

2.1 Backflow Prevention

- A. Manufacturers
 - 1. Febco only
- B. Double Check or Reduced Pressure Backflow Assembly as required by AWWA.

2.2 Water Meters-Building

- A. Type:
 - 1. Up to 2" and 170 GPM-disc style displacement
 - 2. Greater than 2" or greater than 170 GPM: Turbine style
- B. Conform to AWWA C700/701. Bronze body and bronze flanges.
- C. Turbine style measuring element shall consist of transmission coupling, insert, rotor, inlet and outlet straightening vanes with nose cones, calibration ring assembly.



- D. Register: Permanently sealed, tamperproof to record flow in gallons on an odometer and provide with pulse output to the BAS system. Coordinate with Section 230900.

2.3 Water Hammer Arrestors

- A. Copper construction, piston type, suitable for temperature to 200 degrees F and maximum 200 psi working pressure. PDI seal of approval.

2.4 Trap Primers

- A. Mechanical: Flush valve adapter trap primer assembly: Vacuum breaker trap primer, chrome plated tubing; compression fittings and escutcheons.
- B. Electronic: Electronic trap priming assembly_pre-assembled and pre-piped with $\frac{3}{4}$ " bronze female inlet ball valve; $\frac{3}{4}$ " brass electronic solenoid valve and type "L" copper manifold with $\frac{1}{2}$ " brass compression fittings. Primer includes vacuum breaker and NEMA#1 enclosure. 120V power supply.

2.5 Exterior Wall Hydrants

- A. Exterior hose bibbs shall be frost-proof and self-draining with atmospheric vacuum breakers.

2.6 Below Grade Piping (under and within 5 feet of the building)

- A. Copper Tubing: hard drawn, Type K
 1. Fittings: wrought copper and bronze
 2. Joints:
 - a. BCuP silver braze
 3. Exception: Trap primer piping below slab may be continuous lengths of soft copper provided piping has no joints under the slab.



4. Wrap for Underground Piping: Polyvinyl tape pipe wrapping, 20 mil thickness, with identification per IAPMO.
- B. Copper Tubing: annealed, Type K
 1. Fittings: none
 2. Joints: none
 - C. Ductile Iron Pipe
 1. Fittings: Ductile iron, standard thickness
 2. Joints: rubber gasket with $\frac{3}{4}$ inch diameter rods

2.7 Above Grade Piping

- A. Copper
 1. Tubing: Type L, hard drawn
 2. Fittings: wrought copper and bronze
 3. Joints:
 - a. Solder, Grade 95TA
 - b. Copper press fittings with a factory installed EPDM sealing element. The sealing element shall, when unpressed, shall assure leakage of liquids to provide the installer quick identification of joints that have not been pressed prior to placing system into operation. Fittings shall be rating for a maximum of 300 psi. Viega ProPress or approved equal.
- B. PEX
 1. Piping: PEX-a pipe and fittings.
 2. Fittings: expansion style to maintain same pipe diameter through fitting.
 3. See part 3 where use is allowed.



2.8 Valves

A. Gate Valves

1. Up to and including 2 inches:
 - a. Class 125, bronze body, bronze trim, non-rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends
2. 2½ inches and larger:
 - a. Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor—OS&Y.

B. Globe Valves

1. Up to and including 2 inches:
 - a. Class 150, bronze body, bronze trim, handwheel, Teflon disc, solder or threaded ends
2. 2½ inches and larger:
 - a. Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

C. Ball Valves

1. Up to and including 3 inches:
 - a. Class 150, 400 psi, bronze two-piece body, chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with union.

D. Butterfly Valves

1. 2 inches and larger:
 - a. 200 psi, bronze body, 316 stainless steel disc, resilient replaceable Buna N seat, wafer or lug ends, extended neck, stainless steel stem, infinite position lever handle with memory



stop. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

E. Swing Check Valves

1. Up to and including 2 inches:

- a. Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends

2. 2½ inches and larger:

- a. Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged ends

F. Spring Loaded Check Valves

1. Up to 2 inches:

- a. Class 125, cast bronze. Stainless steel stem, Buna Disc, Teflon seat ring, beryllium copper spring, screwed ends

2. 2½ inches and larger:

- a. 125 lb. wafer or flanged cast iron body, renewable bronze seat and disc, stainless steel spring

2.9 Flow Control Balancing Valves

- A. Reserved space for future content

2.10 Relief Valves

- A. Reserved space for future content

2.11 Strainers

- A. Reserved space for future content.



2.12 Thermometers

- A. Adjustable angle, brass stem with 2 ½" insertion length, brass sockets with or without extensions, scale appropriate for intended use. Spirit filled. Mercury not allowed.

2.13 Pressure Gauges

- A. 4½ inch dial; dry filled, cast aluminum case with glass window; brass tube and socket; brass movement; painted aluminum dial with black graduations on white background; suitable for outdoor use; psi scale as appropriate for intended use; full scale accuracy of plus or minus 1 %.
- B. Provide with ¼" NPT brass ball valve and brass pressure snubbers with ¼" NPT connection.

3 Execution

3.1 General

- A. Hydrostatically pressure test and clean and flush and disinfect piping prior to connection to campus utility (or existing connections in buildings).
- B. Test in the presence of the Owner's representative. Provide copies of test to the Owner's representative and include in the O&M manual.
- C. Prior to connecting new pipe to system, take samples from 10% of water outlets and from water entry and analyze in accordance with AWWA. Provide lab results to the Owner's representative. Obtain approval from local health department.
- D. Upon completion of a section or of the entire hot and cold-water supply system, it shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used or 100 psig whichever is greater. The water used for tests shall be obtained from a potable source of supply. A fifty (50) pound per square inch air pressure may be substituted for the water test. In either method of test, the piping shall withstand the test without leaking for a period of not



less than thirty (30) minutes. Test water piping to connection point at main outside the building.

3.2 Backflow Prevention

- A. Provide primary facility backflow prevention at the building entrance. Where practical, it is preferred that backflow prevention be located inside the building and not in exterior vaults.
- B. Locate where serviceable and provide easy access for maintenance, removal and/or replacement work. All backflow preventers must be properly supported. Bleeds must be piped to drains.
- C. Where practical and allowed by code such as non-potable applications, back-flow preventors shall be consolidated to reduce number of facility backflow preventors which require regular inspection and ongoing test fees.
- D. Backflow preventors shall meet the approval of the City of Ellensburg Water Department. Ideally no backflow preventer is to be installed above four feet (4') from floor level and shall never be installed more than five feet (5') from floor level unless City approved access platform is provided and no backflow prevention device shall be installed within three feet (3') of any heat producing equipment. When connected to heat producing equipment, backflow preventers shall be protected by a thermal trap
- E. Testing must meet all standards set forth by the State Health Department. Backflow assemblies must be tested and shown to be operable prior to the acceptance of the project. Testing will be at expense of the Contractor.
- F. Backflow preventers shall be installed with provision for thermal expansion where needed.
- G. Backflow preventers must not be located within or above electrical or telecommunication rooms, or spaces with electronic equipment.
- H. RP Style shall not be located in underground mechanical spaces or vaults unless provided with controls and certified to be approved in a potentially submerged use. Consult with Mechanical Plumbing Manager for approval for proposed underground installations.



- I. The campus prefers to use irrigation water sourced from Cascade Irrigation District for landscape sprinklers and there is typically no interface with the building plumbing systems. When this is not practical and a water source is required, locate backflow preventer inside the building.
- J. Make-up water for all hard-piped connections to closed loop hydronic systems shall be protected with an RP style backflow preventor.

3.3 Water Meters

- A. Provide meter at building service to monitor facility water consumption.
- B. Provide at make up to cooling towers and pure water systems to monitor system consumption.
- C. Provide at make up water connections to closed loop hydronic systems to monitor for potential system leakage.
- D. Meter shall report usage (peak and consumption) to the BAS system in Section 23 09 00.
- E. Irrigation water is metered through the Calsense Irrigation system with no metering required by Division 22. Coordinate with the landscape designers.
- F. All meters shall be calibrated with calibration demonstrated to the commissioning agent.
- G. Provide service/repair and calibration for one year period with a final service visit one month prior to end of first year of project warranty.

3.4 Water Hammer Arrestor

- A. Provide water hammer arrestors at all quick closing valves, spray wands, and solenoid valves and at each individual plumbing fixture or battery of fixtures (except drinking fountains) in domestic water systems. Air chambers are not allowed.
- B. Provide shutoff valve at each arrester to facilitate maintenance.
- C. Provide access door to service when required.



3.5 Trap Primers

- A. All floor drains shall have working trap primers with access panel.
- B. Trap primers location must be consolidated and easily accessible.
- C. Provide shut-off valve at each trap primer to facilitate maintenance.
- D. Provide one trap primer per floor drain. Do not combine traps in different rooms to one trap primer.
- E. All trap primers must be labeled to drain.
- F. When available utilize mechanical flush valve adaptor trap primers. When flush valves are not in vicinity, utilize electronic metering type.

3.6 Hose Bibbs and Wall Hydrants

- A. Provide exterior hydrants
 1. On the building exterior for general grounds usage every 100 feet (for use with a 50-foot hose).
 2. At roof level when equipment exists. Where equipment does not exist, provide at least one for housekeeping purposes at each roof level.
 3. Fully recess frost proof wall hydrants in perpendicular “warm” wall.
 4. Roof mounted frost proof hydrants shall drain back to the warm side of the building.
- B. Provide hose bibbs
 1. In each restroom under lavatory or each bank of fixtures
 2. In mechanical rooms
 3. In custodial rooms.
 4. At loading docks and near entry.
 5. In exterior mechanical yards
 6. At outdoor waste collection and recycling areas when attached to the building.



3.7 Thermometers

- A. Provide at inlet and outlet of each heat exchanger and heat producing piece of equipment. Enlarge pipes as required for installation of thermometer sockets on 24 inches of each side of thermometer. Ensure sockets are extended to allow clearance for insulation. Install where temperature is visible from standing person height.

3.8 Pressure Gauges

- A. Provide isolation ball valve and snubbers at each gauge. Extend nipples to allow clearance for insulation.
- B. Provide at each pump. Points of connection shall be before pump strainers (or end suction diffuser) and before the suction and after the discharge of pump. Each point of connection shall have an isolation valve and be manifolded to the gauge.
- C. Provide at building water service and downstream of backflow preventor and PRV.

3.9 Test Plugs

- A. Provide gauge taps/test plugs as follows:
 - 1. Adjacent to pressure gauges
 - 2. Adjacent to thermometers
 - 3. Adjacent to pressure and temperature sensors provided in Section 23 09 00.
 - 4. Inlet and outlet of coil or equipment where pressure and temperature gauges are not furnished.
 - 5. Where gauges and sensors are located at the same hydraulic and thermal point in the piping system a single test plug may be provided.

3.10 Direct Buried Piping

- A. The Architect/Engineer must identify and/or verify critical utilities location on a project-by-project basis.



- B. CWU limits, as much as practical, direct buried water piping with the exception of the building service and trap primer piping.
 - 1. Island fixtures shall be limited in their use and the project engineer shall review the proposed pipe routing and obtain approval from the Mechanical Plumbing Manager.
 - 2. Consider accessible utility trench to service pressurized piping system that would otherwise be buried below the slab.
- C. Provide plastic ribbon pipe makers above direct buried pipe in accordance with Section 220553.
- D. Provide pea gravel or sand bedding and cover around all utility lines. Provide excavation, backfill and compaction in accordance with Division 31. Compaction shall be no less than 90% under paved for cohesive soils and 95% for cohesionless soils. Other areas shall be compacted to no less than 85% maximum density for cohesive soils and 90% relative density for cohesionless soils. During construction all pipe ends must be closed when left unattended.
- E. All domestic water lines must be buried at a minimum depth of forty-eight inches (48").
- F. Utilities Easement. All underground utilities design must be conceived and designed with an "easement approach" in mind, thus facilitating their maintenance and accessibility. The Schematic Design utility site plan and all other utilities site plan(s) thereafter, must clearly indicate the outline of this utility easement.

3.11 Above Grade Piping

- A. Make provisions for drainage at system low points with drain valves.
- B. Press Fittings are not allowed in shafts or other inaccessible locations.
- C. PEX piping
 - 1. Only allowed for limited applications such as residential projects when approved the Mechanical Plumbing Manager.
 - 2. Do not expose to sunlight.
 - 3. Restricted to size 1.5" and smaller.



4. Upsize pipe so that ID is equal or larger in size to conventional copper methods (typically PEX pipe requires one size pipe larger than required by copper pipe sizing).
5. Make provisions for system expansion and contraction
6. Provide supports spaced in accordance with UPC requirements (typically less than $\frac{1}{2}$ the span of copper pipe unless installed in a channel).
7. Generally plastic piping (PVC/ABS/PEX) are not allowed in plenums unless provided with flame/smoke spread characteristics for plenum use.

3.12 Flanges and Unions

- A. For pipe 2" and smaller, provide unions downstream of each valve, on each port of control valves, and at each equipment or piping specialty requiring service. Valves with threaded connections that cannot be rotated shall have unions on both sides of the valve. If equipment or valve has a flanged connection that is acceptable and preferred.
- B. For pipe 2 ½" and greater, provide flanged connections on each side of valve, on each port of control valves, and at each equipment or piping specialty requiring service.
- A. Unions and flanges for serviceable equipment shall be installed in non-parallel lines to eliminate spreading of pipe assembly during servicing.
- B. Utilize dielectric unions when connecting pipe of dissimilar materials. Where possible select new product materials to minimize need and use of dielectric connections.

3.13 Valves

- A. Provide isolation valves to isolate each building as indicated below. Each valve shall be as close to the room or equipment that they isolate. In no cases may the valves be located on any other floor or a building but the floor they serve. Exception: housing may have vertical risers due to short floor to floor heights. For housing provide valves with drains at the base of each vertical riser.
 1. Each building



2. Branch isolation by floor
 3. Each restroom (including single occupant restrooms)
 4. Mechanical rooms
 5. Kitchens
 6. Labs
 7. Shower room
 8. Equipment
 9. Emergency shower stations-provide tamperproof valve locked open. When valve is shutoff for service, labs shall be rendered unoccupiable for chemical use.
 10. Rooms where water heaters are located
 11. Provide within 20 lineal feet of hose bibb.
- B. Provide drain valves at system low points.
 - C. Provide ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. Note: Ball valves shall be limited to pipe sizes 2 inches and smaller.
 - D. Provide globe for throttling, bypass, or manual flow control services.
 - E. Provide spring loaded check valves on discharge of domestic water booster pumps. Provide swing checks for other water applications.
 - F. All valves shall have adequate access for servicing, operation, repairs and/or replacement.
 - G. It is preferred that valves be installed with the stem in the vertical position. Do not install valves with the stem below the horizontal plan.

3.14 Relief Valves

- A. Discharge of relief valves shall pipe as indirect waste to floor drain or other drainage point in a code approved manner. Pipe indirect waste to not allow water to trap in line or flood outlet of relief valve.



- B. Provide unions or flanges on the discharge side of the relief valve to allow for easy removal.

3.15 Booster Pumps

- A. Provide start-up by manufacturers representative. Training provided by manufacturer's representative.

4 Appendix

4.1 Reserved for future.

