SECTION 22 1100

FACILITY WATER DISTRIBUTION

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LANL MASTER SPECIFICATION SECTION

Word file at <https://engstandards.lanl.gov>

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| Rev. 6 Summary of ChangesBackflow preventer articles updated for boiler 250F and UPC 2021 reference. Harmonized with 22 0813. |

This template must be edited for each project.  In doing so, specifier must add job-specific requirements.  Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.  Once the choice is made or text supplied, remove the brackets.  This Section must also be edited to delete requirements for processes, items, or designs that are not included in the project -- and specifier’s notes such as these.  To seek a variance from requirements of the ESM that are applicable, contact the ESM Mechanical[POC](http://engstandards.lanl.gov/POCs.shtml#mech). Please contact POC with suggestions for improvement as well.

When assembling a specification package, include applicable Sections from all Divisions, especially Division 1, General requirements.

Section developed for ML-4 projects.  For ML-1, 2, and 3 applications, additional requirements and independent reviews should be added if increased confidence in procurement or execution is desired; see ESM Chapter 1 Section Z10 Specifications and Quality sections. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

1. GENERAL
	1. SECTION INCLUDES
		1. Building potable [and non-potable] water piping, valves, fittings, circulator pump, and accessories within the building envelope.
	2. SUBMITTALS
		1. Action Submittals:
			1. Catalog data on pipe materials, pipe fittings, valves, circulator pump, and accessories.
			2. [Submit shop drawings showing pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.]
			3. Installation instructions for pumps, valves, and accessories.
		2. Informational Submittals
			1. Field quality-control test reports.
		3. Closeout Submittals
			1. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.
	3. QUALITY ASSURANCE

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The LANL-adopted UPC edition is per ESM Ch. 16, IBC-GEN, Att. A (LBC)

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* + 1. Comply with the Uniform Plumbing Code, IAPMO, [2021].
		2. Comply with NSF/ANSI 61 for materials for water-service piping and specialties for domestic potable water.
		3. Comply with NSF/ANSI 14 for plastic potable-water-service piping.
		4. Piping materials shall bear label, stamp, or other markings of specified testing agency. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
		5. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
		6. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
		7. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
1. PRODUCTS
	1. PRODUCT OPTIONS AND SUBSTITUTIONS
		1. Alternate products may be accepted; follow Section 01 2500, *Substitution Procedures.*
	2. PIPING, BURIED WITHIN THE BUILDING ENVELOPE (within 5 feet of building)

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AWWA C151 available pipe size: 3-64 inches.

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* + 1. Ductile Iron Pipe: AWWA C151.
			1. Fittings: AWWA C110, Ductile-Iron or Gray-Iron, Class 350, or AWWA C153, Ductile Iron Compact Fittings, Class 350.
			2. Joints: AWWA C111, rubber gasket
			3. Jackets: AWWA C105 polyethylene jacket
		2. Copper Tubing: ASTM B88, NSF/ANSI-61, Type K, hard drawn or annealed.
			1. Fittings: ANSI/ASME B16.22, wrought copper.
			2. Joints: Brazed, AWS A5.8, BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480°F.
	1. PIPING ABOVE GRADE

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Specify Type K when design exceeds pressure and temperature ratings of Type L.

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* + 1. Copper Tubing: ASTM B88, NSF/ANSI-61, Type L, hard drawn or annealed.
			1. Fittings: ANSI/ASME B16.22, wrought copper and copper alloy solder-joint, or ASME B16.51 Press-Connect Pressure Fittings.
			2. Joints: ASTM B32, Solder, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin and silver, with melting range 430 to 535°F.
		2. CPVC Pipe and Fittings: ASTM D2846, chlorinated polyvinyl chloride (CPVC) material for water service up to 180°F.
			1. Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement.
	1. UNIONS and Flanges
		1. Union for pipe 2 inches and under.
			1. Copper Tubing: ASME B16.18, NSF/ANSI-61, lead free bronze, solder joint.
		2. Dielectric Union for pipe 2 inches and under
			1. Manufacturer: Watts Model LF4001E.
			2. ASSE 1079, female iron pipe thread to solder connection, rated to 180oF at 250 psi. Less than 0.25% of lead by weight.
		3. Flanges for pipe over 2 inches.
			1. Copper Tubing: ASME B16. 24, NSF/ANSI-61, Class 150, soldered or threaded.
			2. Gaskets: 1/16-inch-thick preformed neoprene.
	2. VALVES
		1. Ball Valves up to 2 inches:
			1. Manufacturer: Nibco 585-66-LF (Lead Free) Series.
			2. MSS SP-110, NSF/ANSI-61/372, 600 psi non-shock cold working pressure (CWP), bronze, two-piece body, stainless steel vented ball, full port, Teflon seats, stainless steel stem, lever handle, solder or threaded ends to suit piping.
		2. Butterfly Valves over 2 inches:
			1. Manufacturer: Nibco LD 2000–LF (Lead Free) Series.
			2. MSS SP-67, NSF/ANSI-61/372, 200 psi non-shock CWP, ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, lug style, extended neck, lever handle, for use between ANSI Class 125/150 flanges.
		3. Gate Valves up to 2 inches:
			1. Manufacturer: Nibco 111-LF (Lead Free) Series.
			2. MSS SP-139, NSF/ANS-61/372, 300 psig non-shock cold working pressure, Maximum 100 psig at 300 F, bronze body, bronze trim, rising stem, hand wheel, inside screw, solid wedge disc, soldered or threaded ends to suit piping.
	3. Swing Check Valves
		1. Sizes up to 2 inches:
			1. Manufacture: Nibco 413-LF (Lead Free) Series.
			2. MSS SP-139, NSF/ANSI-61/372, 200 psig non-shock cold working pressure, maximum 100 psig at 300 F, bronze body, horizontal swing, Y pattern, renewable seat and disc. Solder or threaded ends to suit piping.
	4. Silent check valve
		1. Size up to 2 inches:
			1. Manufacturer: Nibco 480-LF (Lead Free) Series.
			2. MSS SP-139, NSF/ANSI-61/372, Class 125, bronze body, in line lift type, spring-actuated, TFE seat and disc, solder or threaded ends to suit piping.
1. Sizes over 2 inches:
	* + 1. Manufacturer: Nibco F-910-LF (Lead Free).
			2. MSS SP-125, NSF/ANSI-61/372, Class 125, cast iron body, fluid to 200°F, renewable seats and disc, spring actuated, flanged. Use flat face flange and full-face gasket.
	1. PRESSURE REDUCING VALVES (PRV)

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Comply with Mechanical Standard Drawings ST-D2020-2 for PRV piping details.

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* + 1. Manufacturer: CLA-VAL, No. 90-0IAS.
		2. Single seated, hydraulically operated, pilot controlled, diaphragm type valve, 175 psi pressure rating, 180-deg-F maximum water temperature and 15 to 75 psi adjustment range. Pilot control: direct acting, adjustable, spring loaded, and normally open. Valve construction: lead free, globe, ductile iron main valve body and cover, bronze main valve trim, and cast bronze pilot control with stainless steel trim. Repairs must be done without removing valve from line.
			1. Optional Features: Flow clean features and CV flow control (opening speed control).
		3. Capacity/Size:
			1. Flow: [ ] gpm.
			2. Size: [ ] inches with threaded ends (1” to 3”) or ANSI class 150 flanged ends (1-1/2” and larger).
	1. pressure reducing valve (prv)
		1. Manufacturer: CLA-VAL, No. 90-OIAB.
		2. Single seated, hydraulically operated, pilot controlled, diaphragm type valve, 175 psi pressure rating, 180-deg-F maximum water temperature and 15 to 75 psi adjustment range. Pilot control: direct acting, adjustable, spring loaded, and normally open. Valve construction: lead free, glove, ductile iron main valve body and cover, bronze main valve trim, and cast bronze pilot control with stainless steel trim. Repairs must be done without removing valve from line.
			1. [Optional Features: Flow clean strainer and shutoff cocks to isolate pilot system.]
		3. Capacity/Size:
			1. Flow: [ ] gpm.
			2. Size: [ ] inches with threaded ends (1” to 3”) or ANSI class 150 flanged ends (1-1/2” to 36”).
	2. Pressure Reducing valves (PRV): ½” to 2”
		1. Manufacturers:
			1. Cla-Val, CRD-L. Cast bronze, low-lead CuZn21Si3P body and cover, stainless steel trim, reinforced EPDM diaphragm, EPDM rubber disc, and adjustment range [15-65] psi. Repair must be possible without removing valve from the line
			2. Watts Regulator Company, No. LF25AUB or No. LFU5B. Lead-free cast copper-silicon alloy body, stainless steel trim, integral strainer, 160°F maximum water temperature, bypass feature for thermal expansion, and approx. adjustments range [25-75] psi. Repair must be possible without removing valve from line.
		2. Capacity/Size:
			1. Flow: [ ] gpm.
			2. Size: [ ] inches with NP t with union inlet connection.
	3. CIRCULATOR PUMP, HOT WATER
		1. Manufacturer: Bell and Gossett, Series [100].
		2. Cast iron or lead-free bronze body, polypropylene or lead-free brass impeller, steel shaft, suitable for 125 psi working pressure and 225°F water temperature, mechanical seal, direct drive, and oil lubricated drip proof motor, 1750 rpm.
		3. Performance:
			1. Flow: [ ] gpm at [ ] feet head.
			2. Electrical: [ ] hp, [ ] volts, [ ] phase, 60 Hz.
	4. Strainers
		1. Sizes up to 3 inches:
			1. Manufacturer: Watts Series LF (Lead-Free) 777
			2. Lead free cast copper silicon alloy body and cap, NSF/ANSI - 61, 300 psig at 210 F WOG, Y pattern with standard 20 mesh stainless steel screen, threaded or soldered connections.
		2. Size over 2 inches:
			1. Manufacturer: Watts Series 77F-DI-125
			2. Lead free, Class 125 flanged cast iron body, 200 psi at 210 WOG, Y pattern with stainless steel perforated screen and drain/blowoff connection.
	5. HOSE BIB (WALL HYDRANT)
		1. Manufacturer: J.R. Smith Mfg. Co., Model 5609QT.
		2. ANSI/ASME A112.21.3M, non-freeze, integral vacuum breaker, bronze or brass [nickel plated], 3/4-inch exposed hose connection, 1/4 turn, T-handle key.

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BFPs: Comply with Mechanical Standard Drawings ST-D20GEN-1 sheet 1 for threaded end or sheet 2 for flanged ends for backflow preventer details. The LANL Utilities Group water system representative shall approve design and installation of backflow preventers installed outside the building (see Section 33 1000).

The BFP is required to be listed in UPC Table 603.2 Backflow Prevention Devices, Assemblies, and Methods, required by the application.

BFP for water service to boilers (hot water): The BFP is required to be rated to 250°F; see ASME BPVC Section IV HG-705 (c). This applies to both threaded and flanged ends.

For Section IV installation and IAMPO UPC compliance use an ASSE 1012, *Backflow Preventers with an Intermediate Atmospheric Vent* — or ASSE 1081, *Backflow Preventers with Integral Pressure Reducing Boiler Feed Valve and Intermediate Atmospheric Vent Style for Domestic and Light Commercial Water Distribution Systems*.

Suggested Manufacturers: Watts 9D; must meet ASSE 1012.

Additional items may be located using the IAPMO [website search](https://forms.iapmo.org/asse/listed/).

NOTE: BFP series listed below are for cold water service.

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* 1. BACKFLOW PREVENTER, THREADED ENDS
		1. Provide models listed in the latest edition of IAMPO UPC 2021 and compliant with NSF/ANSI-61, *Drinking Water System Components – Health Effects*.
		2. UPC Table 603.2 Backflow Prevention Devices, Assemblies, And Methods, specification ASSE [1013] [AWWA [ ..], ASME [ .], CSA […]
			1. Suggested Manufactures:
				1. Zurn Wilkins, Series 975XL2U. Per ASSE 1013
				2. Watts, Series LF 909. Per ASSE 1013
		3. Assembly, reduce pressure type, lead free, bronze body, with ball type shutoff valves, FNPT ends, test cocks for in line field testing, integral unions between body and shut-off valves, and air gap drain funnel. Maximum water temperature range 33 to [140]°F, maximum rated working pressure 150 psi.
			1. Size: [ ] inch.
	2. BACKFLOW PREVENTER, FLANGED ENDS
		1. Provide models listed in the latest edition of IAMPO UPC 2021 and compliant with NSF/ANSI-61, *Drinking Water System Components – Health Effects.* The BFP is required to be listed in UPC Table 603.2 Backflow Prevention Devices, Assemblies, and Methods.
		2. UPC Table 603.2 Backflow Prevention Devices, Assemblies, And Methods, specification ASSE [1013] [AWWA [ ..], ASME [ .], CSA […]
			1. Suggested Manufactures:
				1. Zurn Wilkins, Model 375AST per ASSE 1013
				2. Watts, Series LF 909. Per ASSE 1013
		3. Assembly, reduced pressure type, lead free, ductile or cast-iron body, with OS&Y shut-off valves, flanged ends, test cocks for in-line field testing, and an air gap drain funnel. Maximum water temperature range 33 to [140]°F, maximum rated working pressure 175 psi.
			1. Size: [ ] inch.
	3. PRESSURE GAUGE

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Refer to manufacturer’s recommendation for gauge pressure ranges. Generally, a pressure range of twice the expected normal pressure is recommended, with maximum working pressure not exceeding 75 percent of the range. If pulsation occurs, working pressure should not exceed 65 percent of the pressure range. Pressure gauges in the suction side of the pump will be vacuum pressure gauges.

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* + 1. Manufacturer: Ashcroft, Type 1009

B. ASME B40.100, Accuracy Grade 1A, maximum plus or minus 1 percent full scale accuracy, minimum 2-1/2 inch dial, stainless steel case, phosphor bronze bourdon tube and 1/4 inch NPT brass bottom connection. Furnish with brass ball valve.

* + - 1. Range: [ ] psi or [See drawings].
	1. THERMOMETER
		1. Manufacturer: Reotemp, Model MM
		2. ASME B40.200, Grade A, maximum plus or minus 1 percent full scale accuracy, bimetal thermometer, mercury free, minimum 4 inches dial, stainless steel case, all angle direct mount, with standard connection.
			1. Range: [ ] degrees F.
			2. Model: [ ]
1. EXECUTION
	1. PREPARATION
		1. Ream pipe and tube ends. Remove burrs.
		2. Remove scale and dirt on inside and outside of pipe before assembly.
		3. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
	2. BURIED PIPING
		1. Provide earth cover, bedding, and warning tape per Drawings and Section 31 2000, *Earth Moving*.
	3. INSTALLATION
		1. Comply with Uniform Plumbing Code (IAMPO), and as applicable with AWWA C600, AWWA M41, and AWWA M23.
		2. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
		3. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls
		4. Install piping to maintain headroom and neither interfere with use of space nor take more space than necessary.
		5. Group piping whenever practical at common elevations.
		6. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
		7. Provide access where valves and other equipment are not exposed.
		8. Install valves with stems upright or horizontal, not inverted.
		9. Pipe relief from safety valves and backflow preventers to nearest floor drain.
		10. Slope water piping and provide drain valves at low points.
		11. Sleeve and caulk pipes penetrating exterior walls or interior bearing walls. Provide waterproof installation for exterior walls. Provide UL/FM approved through-penetration firestop system when penetrating fire-rated barriers (e.g., walls, floors, etc.).
		12. Paint exposed piping in occupied spaces to match background color.
		13. Install chrome-plated steel escutcheons where pipes are not insulated in finished areas.
		14. Provide stops on waterlines for plumbing fixtures. See Section 22 4200, *Plumbing Fixtures*.
		15. Above Grade Piping: Provide ball valves or gate valves in piping 2 inches and smaller and butterfly valves in piping 2 1/2 inches and larger. Provide globe valves for throttling application.
		16. Support piping system in accordance with Section 22 0529, *Hangers and Supports for Plumbing Piping and Equipment.*
		17. [Sleeve pipe penetration and caulk in accordance with Section 22 0548.23, *Vibration and Seismic Controls for Mechanical Systems*.]
		18. Disinfect water distribution system in accordance with Section 22 0816, *Disinfection of Potable Water Piping.*
		19. Pressure test piping system in accordance with Section 22 0813, *Testing Piping Systems.*

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Test piping to 1.5 times operating pressure, 100 psig minimum.

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* + - 1. Potable Water Inside Building: Test with water at [ ] psig for 30 minutes.
			2. Potable Water Site Main to Building Backflow Preventer: Test with water at [ ] psig for 2 hours.
			3. Non-potable Water: Test with water in accordance with the IAPMO UPC at [   ] psig for 30 minutes.
		1. Label piping system in accordance with Section 22 0554, *Identification for Plumbing, HVAC, and Fire Piping and Equipment.*
		2. Insulate piping system in accordance with Section 22 0713, *Plumbing and HVAC Insulation.*

END OF SECTION

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Do not delete the following reference information:

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THE FOLLOWING STATEMENT IS FOR LANL USE ONLY

This project specification section is based on LANL Master Specification Section 22 1100 Rev. 6, dated June 13, 2022.