SECTION 23 2215

STEAM AND CONDENSATE HEATING PIPING and Specialties

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LANL MASTER SPECIFICATION SECTION

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

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| Rev. 2 Summary of ChangesInserted test pressures and duration for piping pressure tests. Updated Code references. Clarified use of unlisted components from the LANL Reputable Manufacturers List. |

This template was developed to meet the requirements of ASME B31.9-2020, which is valid for steam/condensate up to 150 psig pressure and 0-366°F temperature range. For piping systems outside of this scope, edit to meet ASME B31.1-2020 or latest edition.

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.  Also edit to delete Section requirements for processes, items, or designs that are not included in the project -- and specifier’s notes such as these.  This Section template is tailored to meet requirements contained in the LANL Engineering Standards Manual (ESM). 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.

This template was 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.

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1. GENERAL
	1. SECTION INCLUDES
		1. Building steam and condensate service piping, fittings, valves, etc. downstream of the first steam shutoff valve inside building.
		2. Piping specialties downstream of first steam shutoff valve inside building:
			1. Steam traps
			2. Steam air vents
			3. Vacuum breakers
			4. Pressure gauges
			5. Pressure reducing valves
			6. Safety relief valves
			7. Control valves
			8. Pump-Traps (steam-powered condensate pump)
	2. RELATED SECTIONS
		1. Section 01 2500, *Substitution Procedures*
		2. Section 01 4000, *Quality Requirements*
		3. Section 01 4115, *Pressure Safety Submittals*
		4. Section 01 4200, *References*
		5. Section 01 4444, *Offsite Welding & Joining Requirements*
		6. Section 01 4455, *Onsite Welding & Joining Requirements*
		7. Section 01 4631, *Welding of ASME B31 Piping*
		8. Section 01 4731, *Flange Assembly for B31 Systems*
		9. [Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*, for requirements pertaining to [manufacturer’s certification][and][special certification].]
		10. [Section 01 8113 [LEED v4 and]Guiding Principles 2020: *Requirements for water efficiency, energy efficiency, material composition, and indoor air quality requirements]*
		11. Section 22 0529, *Hangers and Supports for Plumbing Piping and Equipment*
		12. [Section 22 0548.23, *Vibration and Seismic Controls for Mechanical Systems* for [seismic-design criteria,] submittal requirements, devices for seismic restraint, and installation requirements for these devices.]
		13. Section 22 0554, *Identification for Plumbing, HVAC, and Fire Piping Equipment*
		14. Section 22 0713, *Plumbing and HVAC Insulation*
		15. Section 22 0813, *Testing Piping Systems*
		16. Section 23 2500, *HVAC Water Treatment*
	3. submittals

Submit the following per Project submittal procedures.

* + 1. Action Submittals:
			1. Catalog data on pipe materials, pipe fittings, valves, and piping specialties specified including electrical characteristics and connection requirements. Manufacturer’s catalog information shall include valve data and rating for each service. Catalog data shall include the product description, model, dimensions, component/service sizes, rough-in requirements, and finishes used for the project.
			2. Spare Parts and Maintenance Materials list
			3. Installation, Operation, & Maintenance Manual
			4. Warranties
			5. Per the requirements of 01 4444, *Offsite Welding and Joining Requirements* and/or 01 4455, *Onsite Welding and Joining Requirements*, submit:

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When Offsite only, delete submittals below regarding Onsite welding. For high-risk applications such as FS1 or FS 2 or ML-1 or ML-2, add submittals for “Weld Filler Material Control Procedures” and “Filler Material Certified Material Test Reports CMTRs)” when required. Add “Post-Weld Heat Treatment Procedures” when required.

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* + - * 1. Welding Procedure Specification (WPS) and supporting Procedure Qualification Record (PQR). [Note: For onsite welding use of LANL WPS/PQR is the default; coordinate usage with the LANL CWI; no submittal required]
				2. Welder Performance Qualification Records (WPQR) including continuity [Note: For Onsite, welders are tested by LANL who will produce WPQR and track continuity; this includes brazing, bonding, and fusing; no submittal required]
				3. Inspector qualification records
				4. Inspection procedures
				5. Weld inspection report(s) and weld map(s)
		1. Closeout Submittals:
			1. Submit under this Section the system and component documentation per Section 01 4115, Pressure Safety Submittals.
			2. Submit installation examination evidence documentation required by Article 3.1 of this Section.
	1. QUALITY ASSURANCE

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Steam and condensate piping with design pressure of greater than 150 psig or temperature of greater than 366 deg. F shall comply with ASME B31.1, *Power Piping*. Otherwise, ASME B31.9, *Building Services Piping* shall apply.

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* + 1. Comply with [ASME B31.1-[2020], Power Piping] [and] [ASME B31.9-[2020] Building Services Piping] for installation of piping systems and ASME Section IX for welding materials and procedures.
		2. Welders Certification and Qualified Procedure Standards per Section [01 4444, Offsite Welding and Joining Requirements] [and] [01 4455, Onsite Welding and Joining Requirements].
		3. Comply with AWS D1.1 for welding hanger and support attachments to building structure.
1. PRODUCTS

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Comply with ASME B31.9, *Building Services Piping*, for a maximum steam working pressure (WSP) of 150 or a maximum working temperature of 366 deg. F. If these parameters are exceeded, comply with B31.1, *Power Piping*, and update the specified products/ratings as necessary. Modify components and add additional components as needed.

All the following components are either standard piping components (listed items) per ASME B31.9 para. 926 or have previously LANL approved unlisted component evaluations per ASME B31.9 para. 904.7.

The types of components shown may be a non-exhaustive list. Any substitutions or additions shall be ASME B31.9 compliant. All previously LANL approved B31.9 components are available in LANL ESM Ch. 17.

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2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

* + 1. Alternate products may be accepted; follow Section 01 2500, *Substitution Procedures.*
	1. [SEISMIC PERFORMANCE REQUIREMENTS]
		1. The [Piping][, and \_\_\_\_\_\_\_\_\_\_] shall remain in place without separation of any parts when subjected to the design basis earthquake [per Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*] [as represented by the seismic forces derived from the criteria indicated [on the drawings] [in Section 22 0548.23, *Vibration and Seismic Controls for Mechanical Systems*].
	2. STEAM PIPING, ABOVE GRADE (150 PSIG MAXIMUM)
		1. Pipe and Fittings above 2 inches: Black steel, Schedule 40, ASTM A53, Grade B, (welded or flanged joints).
		2. Pipe and Fittings up to 2 inches: Black steel, Schedule 80, ASTM A53, Grade B, (threaded joints).
		3. Fittings (threaded): Malleable iron, ASME B16.3, Class 150 for pressures of 15 psig or less, Class 300 for pressures above 15 psig. NOTE: Eccentric threaded fittings are not available in malleable iron. Use steel butt welded eccentric fittings or threaded carbon steel, ASTM A234, reducing eccentric swage nipples.
		4. Fittings (socket weld, for pipes up to 2 inches): Forged steel, ASTM A105, Class 3000, ASME B16.11.
		5. Fittings (butt weld, for pipes above 2 inches): Steel, ASTM A234, Grade WPB, ASME B16.9.
		6. Joints: Threaded for pipe sizes up to 2 inches, welded or flanged for pipe sizes above 2 inches.
	3. CONDENSATE PIPING, ABOVE GRADE (150 PSIG MAXIMUM)
		1. Pipe and Fittings above 2 inches: Black steel, Schedule 80, ASTM A53, Grade B, (welded or flanged joints).
		2. Pipe and Fittings up to 2 inches: Black steel, Schedule 80, ASTM A53, Grade B, (threaded joints).
		3. Fittings (threaded): Malleable iron, ASME B16.3, Class 150 for pressures of 15 psig or less, Class 300 for pressures above 15 psig. NOTE: Eccentric threaded fittings are not available in malleable iron. Use steel butt welded eccentric fittings or threaded carbon steel, ASTM A234, reducing eccentric swage nipples.
		4. Fittings (socket weld, for pipes up to 2 inches): Forged steel, ASTM A105, Class 3000, ASME B16.11.
		5. Fittings (butt weld, for pipes above 2 inches): Steel ASTM A234, Grade WPB, ASME B16.9.
		6. Joints: Threaded for pipe sizes up to 2 inches, welded or flanged for pipe sizes above 2 inches
	4. UNIONS and FLANGES
		1. Unions for pipe sizes up to 2 inches: ASME B16.39, malleable iron, threaded, Class 150 for pressures of 15 psig or less, Class 300 for pressures above 15 psig.
		2. Flanges for pipe sizes above 2 inches: Forged steel, ASTM A105, Class 150, weld neck, raised face, dimensions per ASME B16.5.
	5. GASKET MATERIAL
		1. Spiral wounded metal gasket, 1/8 or 3/16 inch thick, temperature up to 850F, stainless steel winding and flexible graphite filler, manufactured to ASME B16.20, suited for ASME B16.5 flanges.
	6. Manufacturer: Garlock Flexseal Style RW or Flexitallic CG style.
	7. Torque bolts for flanges to [xx] ft-lb., per Garlock requirements for specified gasket.
	8. BOLTS, STUDS AND NUTS
		1. Bolts/Studs: Alloy steel, ASTM A193, Grade B7.
		2. Nuts: Carbon steel, ASTM A194, Grade 2H.
	9. STEEL GATE VALVES (Up to 2 inches)
		1. Manufacturer: [Vogt, Series 12111], [Powell Figure GA08], or [Velan 2054B-02Y Series]
		2. Forged steel, ASTM A105, Class 800, steam service, 500°F at 1,610 psig, rising stem, threaded ends (ASME B1.20.11), bolted bonnet, ASME B16.34.
	10. STEEL GATE VALVES (above 2 inches)
		1. Manufacturer: [Powell, Figure 1503N] [Velan 0064C-02TY Series].
		2. Cast carbon steel, ASTM A216, Grade WCB, Class 150, steam service, 500°F at 170 psig, rising stem, flanged (ASME B16.5) or welded (ASME B16.25) ends to suit piping, bolted bonnet, ASME B16.34. Furnish chain-wheel operators for valves 6 inches and larger mounted over 7 feet above the floor.
	11. STEEL GLOBE VALVES (Up to 2 inches)
		1. Manufacturer: [Vogt, Series 12141], [Powell, Figure GL08], or [Velan 2014B-02TY Series].
		2. Forged steel, ASTM A105, Class 800, steam service, 500°F at 1,610 psig, rising stem, threaded (ASME B1.20.11) ends, bolted bonnet, ASME B16.34.
	12. STEEL GLOBE VALVES (above 2 inches)
		1. Manufacturer: [Powell, Figure 1531[, [Velan 0014B-02TY Series].
		2. Cast carbon steel, ASTM A216, Grade WCB, Class 150, steam service, 500°F at 170 psig, rising stem, flanged (ASME B16.5) or welded (ASME B16.25) ends, bolted bonnet, ASME B16.34. Furnish chain-wheel operators for valves 6 inches and larger mounted over 7 feet above the floor.
	13. BRONZE GATE VALVES (Up to 2 inches)
		1. Manufacturer: Powell, Figure 500 or Nibco, T-111.
		2. Bronze, ASTM B62, Class 125, steam service, 350°F at 125 psig, threaded bonnet, rising stem, solid wedge, threaded (ASME B1.20.1) ends, MSS SP-80.
	14. BRONZE GLOBE VALVES (Up to 2 inches)
		1. Manufacturer: Powell, Figure 650 or Nibco, T211.
		2. Bronze, ASTM B62, Class 125, steam service, 350°F at 125 psig, threaded bonnet, integral seat, threaded (ASME B1.20.1) ends, MSS SP-80.
	15. BRONZE CHECK VALVES (Up to 2 inches)
		1. Manufacturer: [Powell, Figure 578] or [Nibco, T413].
		2. Bronze, ASTM B62, Class 125, steam service, 350°F at 125 psig, horizontal swing, integral seat, renewable discs, threaded (ASME B1.20.1) ends, MSS SP-80.
	16. STEEL CHECK VALVES (Up to 2 inches)
		1. Manufacturer: Powell, Figure SW08 or Vogt, Series S701
		2. Forged steel, ASTM A105, steam service, Class 800, 1,610 psig at 500F, bolted bonnet, horizontal swing, threaded (ASME B1.20.1) connections, ASME B16.34.
	17. STRAINERS
		1. Pressures 15 psig or less (up to 2 inches): “Y” Type, rated for 125 psig steam, service to 350°F, 20 mesh stainless steel screens, bronze body (ASTM B62), threaded (ASME B1.20.1) connections, with lockable ball valve and plug.
1. Manufacturer: Nibco T-221-A.
	* 1. Pressures above 15 psig: “Y” Type, rated for 150 psig steam service to 490°F, 20 mesh stainless steel screens, cast steel body (ASTM A216, Grade WCB), spiral wound stainless steel gasket, threaded (ASME B1.20.1) or flanged (ASME B16.5), with lockable ball valve and plug.
			1. Manufacturer: Keckley SB-7 (threaded), SA-7 (flanged) or Watson McDaniel CSY (threaded).
	1. Float and thermostaTic trap (up to 75 psig)
		1. Manufacturer: Watson McDaniel FT series
		2. Trap: Cast iron (ASTM A-126) body, stainless steel float and valve, maximum 75 psig @ 450F, threaded (ASME B1.20.1) connections.
			1. Capacity: [ ] lbs/hr condensate at [ ] inlet pressure.
			2. Size: [ ] inch. [Minimum ¾ inch].
		3. Not for use in systems with superheated steam.
	2. FLOAT AND THERMOSTATIC TRAP
		1. Manufacturer: Watson McDaniel, FT600.
		2. Trap: Cast Steel body (ASTM A216), with stainless steel interior parts, stainless steel thermostatic air vent, maximum operating pressure of 670 psig @ 750F, horizontal installation, threaded (ASME B1.20.1) or flanged (ASME B16.5) connections.
			1. Capacity: [ ] lbs/hr condensate at [ ] psig inlet pressure.
			2. Size: [ ] inch. [Minimum size 3/4 inch.]
		3. Not for use in systems with superheated steam
	3. THERMOSTATIC TRAP
		1. Manufacturer: Watson McDaniel, Series WT 2500.

B. Trap: Cast iron body (ASTM A126), stainless steel thermal element, maximum operating pressure 250 psig at 450°F, threaded (ASME B1.20.1), horizontal or vertical installation.

* + - 1. Capacity: [ ] lbs/hr condensate at [ ] psig inlet pressure.
			2. Size: 1/2 inch or ¾ inch.
		1. Not for use in systems with superheated steam.
	1. THERMOstatic TRAP
		1. Manufacturer: Yarway 761-5 FNPT Series

B. Trap: Stainless steel construction (ASTM SA-183) maximum operating pressure 300 psig at 750 degrees F.

* + - 1. Capacity: [ ] lbs/hr condensate at [ ] psig inlet pressure.
			2. Size: [ ] inch. [Minimum size 3/4 inch.]
		1. Not for use in systems with superheated steam.
	1. STEAM AIR VENTS
		1. Manufacturer: Watson McDaniel, AV2000 series
		2. Air Vent: Stainless steel body (ASTM 351) with stainless steel interior parts, stainless steel strainer screen, maximum pressure of 650 psig @ 750 F, threaded (ASME B1.20.1) connections.
			1. Capacity: [ ] SCFM at [ ] inlet pressure psig.
			2. Size: [ ] inches.
	2. VACUUM BREAKER
		1. Manufacturer: Watson McDaniel, WVBSS-12-N
		2. Vacuum Breaker: Stainless steel body with stainless steel interior parts, maximum pressure of 300 psig @ 750F, threaded (ASME B1.20.1) connection.
			1. Capacity: 2.4 SCFM @ 2.0” HG vacuum.
			2. Size: 1/2 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.

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* + 1. Manufacturer: Ashcroft, Type 1009
		2. Gauge: ASME B40.100, Accuracy Grade IA, [2-1/2 inch] or [3-1/2 inch] dial , 1/4 inch NPT brass bottom connection, phosphor bronze bourdon tube, maximum plus or minus 1 percent accuracy full scale, stainless steel case, temperature limit of -40F to 200F, and with stainless steel tube.
			1. Range: [ ] psi or [See Drawings].
	1. MOISTURE SEPARATOR (up to 4 inch size)
		1. Manufacturer: Watson McDaniel, [WCIS1 or WCIS2 (threaded)] or [WCIS3 (flanged)].
		2. Moisture Separator: Cast iron (ASTM A126) body, impingement type, maximum pressure 160 psig @ 428F, horizontal installation, and threaded (ASME B1.20.1) or flanged (ASME B16.5) connections.
			1. Capacity: [ ] lbs saturated steam at [ ] inlet pressure.
			2. Size: [ ] inch [NPT or flanged connections], with [3/4”][1”] drain trap connection.
	2. PRESSURE REDUCING VALVE
		1. Manufacturer: Armstrong GP-1000 (up to 4 inch).
		2. Pressure Reducing Valve: Ductile iron (ASTM A536) body, pilot-controlled (internal), stainless steel internal pilot valve and seat, stainless steel diaphragm, external adjusting screw with locking nut, maximum pressure of 150 psig @ 450F, threaded (ASME B1.20.1) or flanged (ASME B16.5) connections.
			1. Capacity: [ ] lbs/hr at [ ] psig inlet and [ ] psig outlet pressures.
			2. Size: [ ] inch - threaded up to 2 inches, flanged over 2 inches.
			3. Cv: [ ].
	3. SAFETY RELIEF VALVES
		1. Manufacturer: Kunkle, [6010 (threaded ends, bronze body)] or [6252 (flanged ends, cast iron body).
		2. Valve: ASME approved, N.B. certified, lever handle, factory tested and adjusted, maximum pressure 250 psig @ 406°F.
			1. Capacity and set pressure: [ ] lbs/hr at [ ] psig.
			2. Orifice Size: [ ] sq. inch.
			3. Size: [ ] inch - threaded up to 2 inches, flanged over 2 inches.
			4. Accessories: Drip pan elbow shipped loose, same size as relief valve outlet.
	4. Control valve with electrical actuator
		1. Manufacturer: Armstrong, Python-Ael.
		2. Valve: Carbon steel (ASTM A216 Gr. WCB) body, stainless steel bonnet, stainless steel stem, carbon filled V-Teflon packing (450F maximum), linear trim characteristic, [cage guided parabolic pressure balanced trim for shutoff pressure of 725 psig] or [contoured top guided parabolic unbalanced trim for shutoff pressure of 100 psig], ANSI Class IV leakage, and threaded (ASME B1.20.1) or flanged (ASME B16.5) connections.
		3. Actuator: [24VAC] or [120V AC], Auto/Manual control, control signal [4-20 mA] or [0-10V].
		4. Size: [ ] inch.
		5. Cv: [ ].

2.28 Pump-trap (steam powered condensate pump) \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Complete skid-mounted unit, including receiver tanks, pump(s), check valves, etc., all fully piped are available. It is recommended that a receiver tank be specified when above ground steam/condensate distribution lines feed the building. Consult with the motive pump distributor for selection guidance. Specify ASME coded receiver tanks.

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* + 1. Manufacturer: Watson McDaniel, [Series PMPT (Ductile Iron Body)] or  [ ].
		2. Pump-Trap: Internal float trap powered by steam, ductile iron (SA-395) body, stainless steel cover, stainless steel check valves (inlet and outlet), maximum operating pressure of 125 psig @ 366F, [1 inch] or [1-1/2 inch] threaded (ASME B1.20.1) connections, and ASME Code Stamp.
1. EXECUTION
2. INSPECTION/EXAMINATION
	1. Inspection and Examination shall conform to Section 936 of ASME 31.9.
	2. Examination activities to verify the quality of the work must be performed by persons other than those who performed the activity being examined. Such persons must not report directly to the immediate supervisors responsible for work being examined.
	3. The fabrication documentation must have evidence of the examination, the evidence must be maintained in the pressure system documentation package submitted to the pressure safety officer.
	4. PREPARATION
		1. Ream pipe and tube ends. Remove burrs.
		2. Remove scale and dirt on inside and outside of piping before assembly.
		3. Prepare piping connections to equipment with flanges or unions.
		4. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction, protect open ends with temporary plugs or caps.
		5. [After completion, fill, clean, and chemically treat systems. Refer to Section 23 2500, *HVAC Water Treatment*.]
	5. INSTALLATION
		1. Install steam and condensate service piping, fittings, valves, and specialties per manufacturers’ instructions, design drawings and this Section.
		2. Comply with Section 01 4631, *Welding of B31 piping.*
		3. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
		4. Install piping to conserve building space and not interfere with use of space.
		5. 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.).
		6. Support piping per Section 22 0529, *Hangers and Support for Plumbing Piping and Equipment*.
		7. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
		8. Provide clearance for installation of insulation and access to valves and fittings.
		9. Provide safe access or remote operators where valves and fittings are not exposed or installed over 7 feet in height above finished floor.
		10. Slope steam and condensate piping 1 inch in 40 feet (0.25 percent) in direction of flow.
		11. Install valves with stems upright or horizontal, not inverted.
		12. Use threaded bronze valves and strainers in piping up to 2 inches, for design pressures 15 psig or less.
		13. Use threaded steel valves and strainers in piping up to 2 inches, for design pressures above 15 psig.
		14. Use welded or flanged steel valves and strainers in piping above 2 inches.
		15. Provide eccentric reducers, flat on bottom, in horizontal runs of steam and condensate piping.
		16. Provide globe valves for throttling, bypass, or manual flow control services.
		17. Provide gate valves inside building to isolate equipment or part of piping system.
		18. Provide [1/2”][3/4”] bypass valve around all gate isolation valves ≥ 2 inches for slow piping heat-up.
		19. Connect steam and condensate branch lines into top of main or at a 45-degree angle from top of main.
		20. Provide condensate piping no smaller than trap inlet.
		21. Label piping per Section 22 0554, *Identification for Plumbing, HVAC, and Fire Piping and Equipment.*
		22. Pressure test piping per Section 22 0813, *Testing Piping Systems,* at the pressures and durations indicated:
			1. Steam and Condensate Service Piping
				1. Test with water at [ ] psig. IAW B31.9, B31.9 para 937.3. Test pressure shall be maintained for 30 minutes.

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Test steam and condensate service piping to 1.5 times design pressure.
Note: ASME B31.9 Paragraph 937.3.5 only requires the test pressure to be maintained for a minimum of 10 minutes.

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* + 1. Insulate piping per 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 23 2215 Rev. 2, dated May 20, 2022.